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an international quarterly of discussion, research, and theoretical inquiry in Non-Aristotelian systems and General Semantics

in this issue:

CYBERNETICS and MATHEMATICAL BIOLOGY—what relations have these to the study of General Semantics? ANATOL RAPOPORT and ALFONSO SHIMBEL offer an answer.

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The neurological bases of the process of abstracting are examined by RUSSELL MEYERS.

EVELYN T. RIESMAN finds childhood memory a determinant in the content of the paintings of Joan Miró.

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ETC.:

A REVIEW OF GENERAL SEMANTICS

MATHEMATICAL BIOPHYSICS, CYBERNETICS AND GENERAL SEMANTICS

ANATOL RAPOPORT[1]
ALFONSO SHIMBEL[1]

The Importance of 'Bastard' Sciences

IN A SOCIETY where great emphasis is placed on specialization and division of labor, there is likely to develop a notion that knowledge and techniques fall into 'natural' divisions, each pertaining to some discrete, well-defined aspect of living. The general semanticist will, of course, take issue with the 'naturalness' of the divisions. Like any other classification, division of knowledge and techniques into autonomous specialties can be justified for the general semanticist only on pragmatic grounds. Instead of asking, 'What are the "natural" divisions?' he will ask, 'Given such and such classification, what can be achieved?'

The achievements of specialization are evident. Modern science and industry are so complex and the standards of scholarship so exacting that it is impossible for any one to master more than a narrow sector of knowledge. If achievements are measured by the extent to which man can know and manipulate his environment, then the pragmatic justification for specialization has been given.

However, there is also a sordid side to specialization. As Norbert Wiener has pointed out,

> A man may be a topologist or an acoustician or a coleopterist. He will be filled with the jargon of his field and will know all its literature, and all its ramifications, but, more frequently than not, he will regard the next subject as something belonging to his colleague three doors down

[1] Committee on Mathematical Biology, University of Chicago.

the corridor, and will consider any interest in it on his own part as an unwarrantable breach of privacy.[2]

The notions 'your field' and 'my field' carry with them two unfortunate implications. To begin with, such 'cubicle' thinking bears a disturbing resemblance to the process of severe 'inbreeding' with its accompanying tendency to loss of vigor. The damaging results of this tendency are not too serious, inasmuch as they are confined to the devitalization of a limited number of qualified scientists and scholars.

The second implication has more serious consequences. Specialization becomes *institutionalized*. The innumerable '-ologies' provide a framework for the administrative apparatus of our institutions of learning. As is usual, the administrative structure is even more static than the conceptual hierarchies of the academicians, so that attempts on the part of non-conformists to commit 'breaches of academic privacy' are countered not only by the resentments of the 'specialists' but also by the formidable forces of administrative authority.

Such are the effects of elementalistic orientation on learning and science. The effects of either-or attitudes are no less telling and are the more profound the farther removed is a field of endeavor from the emancipated, non-aristotelian areas of physical science. In the latter it is generally recognized that a 'theory' is not 'reality'; it does not even describe reality but is only a set of directions for manipulating symbols in order to make predictions. Thus the existence of 'equivalent' theories is possible. In other disciplines, however, particularly in those dealing with human behavior, the tendency is to view each new formulation suspiciously as a 'rival' theory, whose establishment automatically invalidates and dates existing formulations. We have Marxists and Keynesians, Gestaltists and Behaviorists, Freudians, Adlerians, Jungians, and neo-Freudians. One could almost suspect that a jealous and malicious god was deliberately trying to interfere with the construction of the Tower of Science by confusing the language of the builders.

The general semanticist, aware as he is of the limitations inherent in elementalistic and either-or approaches to problems, seeks a way of unifying various points of view, of creating a new language, if necessary, for a more adequate description of the world. Therefore the general semanticist welcomes the rise of bastard sciences.

What are some of these hybrid disciplines and wherein lies the power of their method?

As an early example, one might cite euclidean geometry, the first cross between empirical mathematics and formal logic. Mathematics had existed in Egyptian and Mesopotamian civilizations merely as a description of certain experiences (measurement) and sets of rules for computation. Formal logic, as developed by Aristotle, was little more than a set of rules for making classi-

[2] Norbert Wiener, *Cybernetics*. New York: John Wiley, 1948.

fications. But formal logic applied to a few fundamental postulates of geometry resulted in a magnificent structure of knowledge.

Another example is the cross between algebra and geometry accomplished by Descartes on November 10, 1619. The discovery of a profound correspondence reflected in a formal isomorphism between the language of algebra and that of geometry enabled mathematicians to translate discoveries made in one field into progress in another field. As is usually the case, progress made under such circumstances is 'non-additive.'

Other examples are equally illuminating: mathematical physics, biological chemistry, physiological psychology, biophysics, etc. Two of these areas are quite new. One is *mathematical biophysics;*[3] the other has been christened *cybernetics* by Norbert Wiener and his associates and has at this time about a decade of research behind it.

These two bastard sciences are of particular interest to the general semanticist for two reasons. First, they bear out the principle that a non-elementalistic approach to any field of inquiry is likely to yield 'non-additive' dividends. Thus the general semanticist sees in the fruits of mathematical biophysics and of cybernetics a vindication of non-elementalistic methodology. This is true, of course, of many other such cross-bred disciplines. But mathematical biophysics and cybernetics have even more important implications for general semantics. The understanding of the events in the nervous system and analogous systems *as determined by their structure* is fundamental for the understanding of *abstraction, evaluation,* and *communication,* processes of basic importance in general semantics.

Mathematical Thinking and Human Affairs

IN 1923 Korzybski wrote as follows:

> If there is to be a science of human engineering, it must be mathematical in spirit and in method and if we do not possess methods to apply mathematical thinking to human affairs, such methods must be discovered. Can this be done?
>
> Let us say a word about what has already been accomplished in this direction. The latest researches in the foundations of mathematics, chiefly accomplished by Whitehead, Russell, Poincaré, and Keyser, have disclosed the insufficiency and fallacies of the traditional logic and have produced an internal revolution in logic and mathematics. Mathematics and logic have proved to be one; a fact from which it seems to follow that mathematics may successfully deal with non-quantitative problems in a much broader sense than was suspected to be possible.[4]

[3] A research unit in mathematical biophysics was formed at the University of Chicago in 1935. It is now organized as the Committee on Mathematical Biology.

[4] A. Korzybski, 'Fate and Freedom,' as quoted in *The Language of Wisdom and Folly,* Irving J. Lee, editor.

Elaborating this confidence in the mathematical method as a tool for studying man, Korzybski said in 1933:

> The problems of the world in 1933 are acute and immediate, overloaded with confusion, bitterness, hopelessness, and other forms of semantic disturbances. Without some means — and in this case, scientific and physiological means — to regulate our semantic reactions, we shall not be able to solve our problems soon enough to avoid disasters. The similarity in structure of mathematics, and our nervous system, once pointed out and *applied,* gives us a unique means to regulate the semantic reactions, without which it is practically impossible to analyse dispassionately and wisely the most pressing problems of immediate importance.[5]

All in all, Korzybski's conjectures (conjectures, because of the fragmentary knowledge then available of the similarity of structure between mathematics and the human nervous system) can be summarized in a few principles.[6]

1. *Communication between human beings is possible.*

That is to say, a language can be constructed in which the relations between events in the outside world can be symbolized in such a way that independent observers will arrive at similar symbolizations and by manipulating the symbols according to the rules of the language will arrive at similar conclusions. Korzybski cites mathematics as an example of such a language. A generalization of mathematics is any symbolic system built on structure and order relations *alone.*

2. *The world is knowable.*

Any symbolization of events leads us to expect that certain things will happen. But only *certain* ways of symbolizing lead to predictions which are actually verified. Such self-justifying symbolizations constitute knowledge.

3. *Knowledge is the establishment of ordered structure.*

The perception, interpretation, and evaluation of events is largely a neural process (although actually the whole organism is involved in the act of knowing). 'Knowledge' consists of an ordered sequence of neuromotor events.

4. *Order determines sanity.*

Sanity is a measure of the correspondence between the ordered structure of the neuro-motor events and the ordered structure of the world.

Knowledge as Ordered Structure

FOR the purposes of this discussion, the third principle will be considered first: knowledge is the establishment of ordered structure.

[5] A. Korzybski, *Science and Sanity,* 2nd edition, p. 273.

[6] Not to be confused with the 'non-aristotelian postulates.' The authors believe these principles to underlie the 'jumping off' platform of Korzybski's formulation. In the course of the formulation, he arrives at the necessity of constructing a 'non-aristotelian system.' The non-aristotelian postulates are then offered as the foundations of the system.

The naive, pre-scientific approach to the explanation of phenomena was through the invention of anthropomorphic 'agencies' which were implicitly taken to be sufficient causes. The predominant question was 'Who does it?' not 'What is being done?' And, of course, the nature of the questions determined the limitation of the answers. The quest for 'agencies' yielded a world peopled by river-gods and fates.

The reason one cannot point to a time when 'Who does it?' gave way to 'What is being done?' is that in spite of the verbal dichotomy between the two kinds of questions, the change of attitude was a gradual one. Although formally modern science can be said to be entirely based on the question in the form of 'What is being done?' yet the remnants of the 'Who does it?' attitude are still deeply intrenched in many areas of inquiry. The agencies no longer appear in anthropomorphic garb, *but they are still subjects of sentences,* whose subject-predicate structure almost forces the perpetuation of the old outlook and of its limitations.[7]

The power of the new outlook is embodied in the notion of *invariance.* The abstraction of cardinal number was perhaps the clearest and oldest example of this notion. As Korzybski, Russell, and others have pointed out, a tremendous intellectual revolution sprang from the revelation that a 'brace' of pheasants, a 'pair' of boots, a 'team' of horses, 'twins,' 'couples,' and 'duets' are all instances of a particular *invariance* which we have come to call the cardinal number 'two.' Basically the same kind of revelation underlies the law of gravity. To Newton falling bodies, tides, and the motions of the moon also appeared as instances of an invariance. It is this novel outlook which enabled him to formulate the famous inverse square law.

It is important to note that one cannot point at the 'two-ness' of two cows. Nor can one mine gravity. But it is precisely these 'intangibles' which have proved most useful in the business of scientific map-making. In counting groups of cows and stars we must completely disregard the 'cowness' and the 'starness' of the groups, just as we disregard the 'nature' of the objects subject to gravitational forces in computing the effects of such forces. The things that *do* matter are not the 'nature' of the objects but the *relations* between them. Here knowledge has been reduced to structure and order.

Mathematical Biophysics and Non-Aristotelian Methods

MATHEMATICAL biophysics and cybernetics are programs of research aimed at the discovery of the significant invariants underlying the functioning of the nervous system. Rashevsky, for example, who may be considered the founder of mathematical biophysics, considers the central nervous system as an 'aggregate of a very large number of irritable elements, which all can be divided

[7] For a fuller discussion of the consequences of anthropomorphism in scientific questions see A. Rapoport, 'Newtonian Physics and Aviation Cadets,' *ETC.,* 1.154 (1944).

into two groups: exciting and inhibiting' and proposes 'a systematic study of the simplest cases of interaction which may occur in such an aggregate.'[8]

Thus, the method of mathematical biophysics is geared to the outlook of the general semanticist. As has been pointed out, for the general semanticist the problem of describing the world is a relation-seeking problem. The relations form a *structure* and the properties of this structure are then the properties of the world. To the general semanticist, knowledge means knowledge of structure. This is the epistemological aspect of the problem. But the general semanticist recognizes another aspect, namely, the physiological one. And this aspect also revolves about structure, namely, the structure of the nervous system. In fact, the general semanticist views sanity as a measure of the correspondence between the two structures (see Principle 4 above).

It is most important to remember that the word 'structure' as used here refers to a spatio-temporal configuration of events and not merely to the relative position of objects in space or to the connections between the neural elements. If this extension of the meaning of structure from spatial to spatio-temporal is not made, then the objections of the Gestaltists, Freudians, etc. to what they believe to be the behaviorist point of view are certainly justified. The early behaviorist view that behavior can be explained in terms of the spatial relations between the neural components of an organism rested on the tacit assumption that during an appreciable interval of time the nervous system of an organism is in a certain 'state,' which completely determines what stimulus elicits what response. The neurological basis of this assumption, as pointed out by F. S. C. Northrup, was the hypothesis that 'neurons are always put together in the nervous system to form a path in or through the nervous system which is non-circular.'[9]

This oversimplified notion is untenable in the light of (1) the principle of non-identity, (2) recent neurological findings, and (3) the theoretical investigations of the central nervous system by the mathematical biophysicists.

To begin with, the principle of non-identity, one of the corner stones of general semantics, excludes the possibility of two stimuli being 'identical' and the possibility of defining the 'state' of the nervous system over an appreciable interval of time. Secondly, the neurophysiologists (chiefly Lorente de No, Cannon, and Rosenblueth) have called attention to the importance of *circular* paths (reverberating chains of neurons) in the central nervous system. Finally, Rashevsky has shown by constructing models how circular paths may account for conditioning and gestalt phenomena, while McCulloch, Pitts, Householder, and Landahl have laid the foundations for the mathematical treatment of the spatio-temporal structure of neural nets.

[8] N. Rashevsky, *Mathematical Biophysics*, University of Chicago Press, rev. ed., 1948.

[9] F. S. C. Northrup, 'The Neurological and Behavioristic Psychological Basis of the Ordering of Society by Means of Ideas,' *Science*, April 23, 1948.

This is only one example of how the broad principles of non-aristotelian methodology find a direct counterpart in the recent extension of the physico-mathematical method to psycho-physiology. The work is now rapidly progressing. The Boolean algebra methods of McCulloch and Pitts are being extended to a statistical (probabilistic) formulation, which appears as a generalization of behaviorist views. It was the hope of the general semanticists that such a generalization would be found and would provide an opportunity for constructing a science of man adequate for our times. It is the task of the mathematical biophysicists actually to construct such a science.

At the time Korzybski presented the above-mentioned paper, he could report no more of this task (the physico-mathematical method applied to a science of man) than the work of Whitehead, Russell, Poincaré, and Keyser, who had shown the similarity of structure between logic and mathematics. Today, a quarter of a century later, we can report considerably more.

To begin with, the physiological aspect of the problem had been outlined by Korzybski himself in *Science and Sanity*. And as *Science and Sanity* was being written, isolated investigators were already at work, laying the foundations of a physico-mathematical theory of the nervous system. We have already mentioned Rashevsky and his group, now active at the University of Chicago. Work along similar lines has been carried out by Blair (Rochester, N. Y.), Hill (England), Monnier (France), Schaefer (Germany) and others. The very tools of research which these workers employed (the physico-mathematical method) enabled them to emphasize the important aspects of the problem, namely, *invariants* rather than *agencies*.

Consciousness of Abstracting

TO BE SURE, the point of view has not been left unchallenged. It has been pointed out that the picture of the nervous system as presented, for example, in Rashevsky's *Mathematical Biophysics,* is so abstract as to lose contact with 'reality.' It is maintained that neurons are not simply 'elements,' that the processes underlying their activity are enormously complex, that perhaps they are not even amenable to description in physico-chemical terms, etc. A thorough analysis of these objections is given in the introduction to Rashevsky's book. One can see from his arguments that he is semantically sophisticated. For the sake of continuity, however, we shall briefly reproduce them here using a terminology somewhat more current in the literature of general semantics.

The objection that a formulation deals with 'abstractions' and not 'realities' is a vacuous one, because there is no such thing as a description of 'concrete reality.' No matter how minutely one were to describe a 'neuron' or the sequence of events associated with the interaction of neurons, one would not be describing 'reality' but only selecting certain aspects of it considered pertinent to the problem at hand, that is, abstracting. The question is, therefore, not whether

abstractions as such are justifiable (they cannot be escaped), but which abstractions are useful. Useful for what? Useful for discovering relations to be used in constructing theories from which other relations can be predicted. The verification of predictions implied in the theories is, of course, the test of their truth. But even if the predictions fail to be realized, the framework of the theory is often such that the way to refinement and correction becomes evident and thus progress in the search for truth can be realized. Precisely this is the *raison d'être* of the abstractions made in physics. Every physicist knows that molecules are not perfectly elastic, tiny billiard balls, as they were assumed to be in the first formulations of the kinetic theory of gases. Hence the physicists were not surprised to see that experimental results often deviated significantly from their predictions. But once the 'classical' kinetic theory was developed, ways of introducing corrections suggested themselves and a steady approach to truth became possible. No physicist believes in the existence (except verbally) of 'point masses,' 'rigid bodies,' or 'continuous fluids.' Yet descriptions of events in terms of derived relations between such fictions is what constitutes physics. The physicist is at ease using abstractions, because he knows that abstraction is not reality, the word is not the thing.

Neural Nets

THE VALUE of the abstractions made in mathematical biology should be judged by the effective use to which they can be put. On the basis of Rashevsky's picture of the nervous system, it has been possible to describe *quantitatively* such relations as reaction time as a function of stimulus intensity; reaction time as a function of the interval between a preparatory 'warning' and the stimulus; acuity of discrimination as a function of the magnitude of the stimulus, and many other relations.

The approach has also been extremely useful in suggesting 'models' to account for a wide variety of 'psychological' phenomena, such as conditioned reflexes, error elimination (as observed in maze learning), logical 'thinking,' visual perception and esthetics, and some psychotic states.

Perhaps the most remarkable results of this method are to be found in the area dealing with the so-called 'gestalt phenomena.' These, as will be recalled, consist in the ability of nervous systems to appreciate a great many different stimuli as instances of 'the same thing,' that is, to recognize *invariance.*

> When a square is presented to us in various positions, we still recognize it as a square—in other words, we respond to it always in the same way although the retinal elements involved are quite different each time. Again the square may be of any color, or of the same color but of different brightness. It may be drawn in black lines on a white background or in white lines on a black background. It is still recognized as a square.[10]

Rashevsky then proceeds to describe a model by means of which a 'neural

[10] N. Rashevsky, *Mathematical Biophysics,* revised edition, p. 448.

network' can solve this problem of recognition. Thus the structure of an abstracting system must be considered to have been given.[11]

Thinking Machines, Nervous Systems, and Negative Entropy

IN THE meantime, other workers, studying problems connected with the construction of electronic computers and calculating machines from the point of view of invariances involved in such devices (that is, disregarding the fact that the elements were vacuum tubes, resistors, coils, wheels, etc.) formulated analogous theories.

The two programs of research, a mathematical theory of the nervous system on the one hand and the development of electronic computers on the other, proceeded along parallel lines. As can be readily surmised, such remarkable parallelism could not long remain unnoticed. Workers from both fields soon found themselves talking to each other in a language which was a curious mixture of psycho-physiology (neurons, synapses, refractory periods, threshold, etc.) and electronics (feedbacks, vacuum tubes, amplifiers, transformers, etc.). The mathematics, however, was devoid of such specialized terminology. Its abstractions (integrals, differentials, matrices, series, etc.) were disdainfully indifferent of the uses to which they were put. They reflected the basic invariances common to both sets of phenomena.

It is said that Chinese from different provinces, unable to communicate through spoken language, nevertheless can make themselves adequately understood through writing. Psycho-physiologists and communication engineers found themselves in a similar situation. Although the 'pronunciations' of their respective symbols were widely different, yet the symbols themselves (that is the mathematical expressions) were quite similar.

Thus another border area arose, concerned with problems common to communication engineering and psycho-physiology. Norbert Wiener has recently dubbed it cybernetics, a term from the Greek word for governor, an allusion to the principle of negative feedback.

The wealth of ideas outlined in *Cybernetics* (New York: John Wiley & Sons, 1948) makes it a book of enormous interest to the general semanticist, especially if he is mathematically trained. As an illustration of the close connection between the areas of study pertinent to general semantics and cybernetics, we shall describe one of the topics discussed by Wiener, namely, the relation between 'amount of information' and entropy.

The terms 'order' and 'conditionality of response' occupy, as is well known, a central position in general semantics. The former is one of the basic undefined terms. The latter is a measure of the complexness of adjustments of which an

[11] The general semanticist will immediately recognize in the schematic representation of Rashevsky's model a neural counterpart of the Structural Differential. Subsequently McCulloch and Pitts and later Culbertson constructed other models.

organism is capable. In thermodynamics there exists a quantitative definition of order, or rather a quantitative definition of chaos, namely, entropy, so that a natural quantitative definition of order suggests itself, namely, the negative of entropy.

Although an adequate discussion of the entropy concept is beyond the scope of this article, nevertheless an attempt will be made to illustrate the concept by an elementary example.

Arrange a deck of cards according to suits: hearts, diamonds, clubs, and spades. Note that the first twenty-six cards are all red. Now shuffle the deck thoroughly. Examine the first twenty-six cards. Approximately half of them will be red and the other half black. Now no matter how long you keep shuffling, if you examine the first twenty-six cards now and then, the overwhelming chances are that you will find the same situation: approximately half red, half black. It is practically impossible to bring the cards back into their original order by shuffling. We say that the entropy of the deck has increased. This, indeed, is the essence of the Second Law of Thermodynamics, which implies that all natural processes tend to proceed in the direction of increased entropy (greater chaos or less order). Two different gases brought into contact will soon diffuse into each other because of the random motions of the molecules, and the likelihood that they will ever be found again unmixed is vanishingly small. Heat flows from bodies of higher temperature to those at lower temperature. It is shown by consideration of the molecular structure of bodies that this also implies an increase of chaos.

There are instances, however, where opposite processes seem to occur. The most obvious of these are those where some 'intelligence' seems to interfere. For example, we can take a well shuffled deck of cards and shortly bring it back to its factory order.[12] Involved in such an ordering is a sequence of *decisions* (this card is black; this card is red, etc.). Presumably the decisions are events in the nervous system of some organism or in some 'servo-mechanism,' to use the terminology of communications engineers. It has been conjectured that such decisions and life processes in general are somehow connected with regions where a marked lowering of entropy is taking place. Figuratively speaking, life has been compared to a process which attempts to stem the ever-onrushing tide of chaos. To quote Schroedinger:

> What an organism feeds upon is negative entropy. Or, to put it less paradoxically, the essential thing in metabolism is that the organism

[12] This illustration is not meant as an example contradicting the Second Law of Thermodynamics inasmuch as the system considered is not isolated. It is brought out merely to show that the processes where an 'intelligence' interferes may seem to tend toward decreased entropy whereas they tend toward greater entropy when 'left to themselves.'

succeeds in freeing itself from all the entropy it cannot help producing while alive.[13]

To be sure, a hard-headed, 'realistic' scientist may dismiss such speculations as poetic romanticising, irrelevant to scientific procedure. This austere attitude is, no doubt, a reflection of the exacting standards of modern scientific rigor. Yet let us remember that before a child learns to talk, he must babble.

Towards More Complex Organization

THE EARLY formulations of general semantics, like those of any dynamic *Weltanschauung*, are naturally full of conjectures. The recent investigations of mathematical biophysics and now of cybernetics give ample testimony to the fertility of at least some of those conjectures.

One of them is the notion of an intimate connection between knowledge and ordered structure. Wiener has succeeded in formulating this connection mathematically. From a very natural definition of 'amount of information,' Wiener derives a formal mathematical isomorphism between it and the negative of entropy, which, as has been pointed out, can be taken to be the measure of order. This formulation immediately suggests relations between ordered systems and the dynamics of knowing. Indeed, so remarkable is the parallelism between ordered systems of an 'inorganic' nature and what had long been commonly regarded as 'mental phenomena,' that the remarks of Butler's Philosopher lose their sardonic character and seem to attain a prophetic significance.[14]

Finally, the application of statistical methods to two other important classes of biological problems must be mentioned, namely, the evolution and the developmental embryology of nervous systems. If one takes the point of view that the developmental potential of an organism resides in the structure of its neural net, an obvious question to ask is how this neural net comes into being.

We have already shown how cybernetics seeks to establish a formal mathematical relation between 'amount of information' and 'amount of order.' Translated into psycho-physiological terms, the relation becomes one between 'intelligence' and 'degree of organization,' while the analogous notions in general

[13] E. Schroedinger, *What Is Life?* Compare this definition with Goethe's Mephistopheles' definition of himself as the antithesis of the creative principle:

> I am the Spirit that Denies
> And justly so: for all things, from the Void
> Called forth, deserve to be destroyed.
> 'T were better, then, were naught created.

and his admission of failure:

> How many have I made away with!
> Yet ever circulates a newer, fresher blood.
> It makes me furious, such things beholding:
> From Water, Earth, and Air unfolding,
> A thousand germs break forth and grow . . .

[14] *Cf.* Samuel Butler, *Erehwon.*

semantics would be 'repertoire of semantic reactions' and 'conditionality of response.'

The evidence of evolution indicates that, at least along certain lines, the development of organisms has proceeded in the direction of more complex organization of the nervous system. The authors of the present article have attempted to formulate mathematically the process of embryological development of a neural net by employing statistical and stochastic methods.[15]

Essentially the problem is this: the models of neural nets which Rashevsky, Landahl, Culbertson, McCulloch, Householder, Pitts, and others constructed to account for various psychological phenomena, contain many frequently recurring 'units of structure,' such as cycles, convergences, divergences, cross-connections, etc. How do such structures arise? What variations can be expected between individuals, species, genera, classes, etc.? What are the invariances associated with the process of their development?

In vertebrates, the basic features of the process can be described as follows: Certain regions of the embryonic ectodermal tissue give rise to specialized cells called neuroblasts. In the course of development, each neuroblast grows protuberances (axones and dendrites) which ultimately form connections (synapses) with the dendrites and axones of other neuroblasts. Such a maze of connected neurons (adult neuroblasts) is referred to as a neural net. Certain neurophysiologists, notably P. A. Weiss, have studied the factors influencing the course of such development. In particular they have sought to determine the forces influencing the direction of growth of the axones and dendrites and the specific affinities determining the patterns which are formed by the connections.

In line with this view, the authors have asked the following question. Given an initial distribution of developing neuroblasts, what can be said about the probability of certain patterns arising *in the absence* of any organising influences? In the process of the mathematical formulation of this problem, certain parameters arise, whose variations are a measure of the 'amounts of order' of the system. Hence the growth-determining factors studied by Weiss may be associated with these parameters and integrated into a mathematical theory of neural organization.

Contributions to a Science of Man

IT REMAINS to summarize the contributions which each of the three disciplines discussed here is making toward the development of a science of man.

General semantics begins with the definition of man as a time-binding class of life. Then it seeks to establish those characteristics of the human organism on which its time-binding function depends, namely, the ability to symbolize and communicate experience. This ability is shown to be a survival mechanism

[15] *Cf.* various articles on the statistical approach to the theory of the nervous system by A. Rapoport and A. Shimbel in the *Bulletin of Mathematical Biophysics*, Vol. 10, 1948.

which distinguishes the time-binding species from others. Furthermore, this particular survival mechanism in a sense *includes* other such mechanisms inasmuch as it implies a measure of control over them. Man, for example, by means of his time-binding activities and subsequent accumulation of knowledge, can immunize himself against certain diseases, thereby 'manufacturing' what is commonly called a survival mechanism. Finally, general semantics seeks to develop techniques of symbol manipulation which would insure the maximum utilization of time-binding and thus arrives at the necessity of formulating non-aristotelian systems.

Mathematical biophysics starts with the assumption that so-called 'mental' phenomena can be described in terms of physico-chemical events in mathematical language. Some such descriptions have been successful and have led to inferences concerning the structure of the nervous system. The study of interacting nervous systems leads to a natural extension of this discipline to the social sciences.[16]

Cybernetics seeks invariant relations among servo-mechanisms (*e.g.* nervous systems and electronic computers). These invariants provide clues to the conditions underlying the knowledge of 'universals.' Again a natural extension to social science suggests itself, namely, the consideration of the role of ideas in cultural patterns and in social organization.[17]

Social Implications

WE SEE that each approach leads naturally to the consideration of social phenomena from the point of view of interactions of organisms with particular emphasis on the interaction of their nervous systems. One might say that *the long-range program of this approach is the investigation of the way social phenomena depend on the structure of the nervous systems of the interacting organisms.*

Wiener goes a step further by extrapolating the future development of society not only in terms of the reactions of human nervous systems with each other but also in terms of the relations between human nervous systems and certain devices built by human beings. In fact, these devices can be considered extra-corporeal sensoria (thermometers, galvanometers, radar, geiger counters) and extra-corporeal brains (computers, harmonic analyzers, etc.). It is not at all bizarre to think of such extra-corporeal sensoria and nervous systems as biological adaptations. Indeed, they are not confined to man. Certain species of crustacea have highly innervated pouches into which they insert grains of sand immediately upon birth. The pouches together with the sand then function

[16] *Cf.*, for example, N. Rashevsky, *Mathematical Theory of Human Relations.*

[17] As Northrup suggests in the above mentioned article, 'our problem of determining the relation between cultural factors and biological factors in social science becomes, in part at least, that of determining the relation between the processes of biological systems and the responses of people to particulars which embody universals.'

as equilibrium-preserving mechanisms. These animals are certainly employing extra-corporeal sensoria.

In man this process has been going on for some time, and moreover it is *cumulative*. Wiener considers the implications of this process exceedingly important. He predicts that the 'thinking machines' will make it unnecessary to employ people for making trivial decisions. Hence if our society continues to look upon human labor as a commodity to be bought and sold, we shall eventually reach a stage where a vast majority of people will have 'nothing to sell.' They will become 'superfluous.' Wiener then is forced to the conclusion that either this superfluous population will have to be done away with or *human values will have to be measured in terms other than commercial.*

The authors feel that Wiener's predictions are as yet premature. There is not sufficient evidence to infer the inevitable devaluation of the mediocre decision-maker as such. However, the authors definitely agree with Professor Wiener that the present almost universal evaluation of human beings in terms of the market value of their services (witness the expressions, 'labor market,' 'labor monopoly,' etc., widely used in the commercial press and in orthodox economics) is fundamentally pernicious. When coupled with technological advances, it serves to aggravate the misevaluations and the semantic disturbances which form the core of our social problems.

It is a truism that advances in technology are often accompanied by social ills and catastrophes because of the lag that exists between technological invention and social adjustment. It could be easily imagined that the thinking machines may likewise carry with them potentialities of social disintegration. Whether or not this disintegration can be avoided is an interesting question, but it will not be discussed here. Rather we should like to examine some of the more obvious adjustments of human behavior which will have to accompany the development of thinking machines.

Some of these adjustments have already imperceptibly diffused through our culture. Switchboard girls, comptometrists, I.B.M. operators, etc., are all people who have been trained in the use of extra-corporeal 'nervous systems.' Wherein consists their training? It consists in being able to ask very simple but *meaningful* questions. To be sure, the questions are not asked by the usual form of communication. But neither are mathematical equations stated in 'every day language.' Yet the formulation of a problem as a mathematical equation is essentially a formulation of a question in the most meaningful and manipulable form. And so is the operation of a thinking machine. The development of thinking machines implies primarily a growth of the repertoire of questions which may be meaningfully put to them. Hence, the training of people employed in operating these machines is essentially a training in a *new kind of communication*. This aspect of machine manipulation may seem ludicrous to those who associate contemporary technology with the frustrations of monotonous 'assembly

line' labor. The authors venture to suggest that these frustrations are due not so much to the super-organized character of our production as to the disorganized character of our competitive society. A mathematician 'discoursing' with a mammoth differential analyzer does not feel frustrated.

It takes skill to ask meaningful questions. The history of knowledge is largely a development of the ability to ask such questions and the recognition of their importance. Contrary to this striving for objective cognition run the partialities, wishful thinking, social involvements and superstitions which encumber our communicative process. The thinking machine (at least at this stage of its development) has no ideology. Moreover its 'sanity' is measurable in terms of its performance.

The semantic implications of mathematical biophysics and cybernetics are pointing a way to a measure of our own sanity. How meaningful are the questions we ask ourselves and each other, and to what degree do we let 'static' distort our answers? Perhaps we can eventually manage to keep ourselves at least as sane as our extra-corporeal nervous systems. With that minimum of sanity (i.e., the effective use of our problem-solving potential at all levels of complexity) we may begin to hope for a fuller realization of what Korzybski has called the 'manhood of humanity.'

The statement that social phenomena (or for that matter, any given phenomena) are not amenable to mathematical treatment is in essence an opinion, based on the fact that hitherto no successful application of mathematics to social phenomena has been made. While no one can deny this fact in the past, it is legitimate to challenge such a pessimistic extrapolation into the future.

N. RASHEVSKY, *Mathematical Theory of Human Relations.*

◆

The history of science shows beyond doubt that the vital factor in the growth of any science is not the Baconian passive observation but the active questioning of nature, which is furthered by the multiplication of hypotheses as hypotheses.

MORRIS R. COHEN, *A Preface to Logic.*

CHILDHOOD MEMORY IN THE PAINTING OF JOAN MIRÓ

EVELYN T. RIESMAN*

A REMARKABLE article 'On Memory and Childhood Amnesia' by Ernest Schachtel[1] has stimulated me to explore in the painting of Joan Miró, in whom the childhood subject is obvious, his mode of recalling and using it. The causes of childhood amnesia and the difficulty in overcoming it are, according to Schachtel, twofold: sexual repression, which Freud has described as the sole cause, and an additional factor that Schachtel describes as *a difference in the quality of childhood experiences*. These are richer in sensory value than those of adult life. For in adult life many experiences are determined by our cultural pattern. We experience as we have been taught to, and we recount our experiences in words and categories that, being intensionally established, are easily communicable. And these frames of reference become not only our means of remembering but also our modes of experiencing. Events such as birthdays, graduations, marriages, trips are milestones that are valued and remembered because they are clearly symbolized. But experiences of such things as smells, tastes, textures, sounds are not held as so important and are not easily put into the usual modes of communication. With the loss of the ability or the habit of extensionally experiencing such sensations goes the amnesia of ever having experienced them. The artist, however, makes it his task to experience and recall just such extensional sensations. He sees freshly in other than the conventional schemata of perception and so is able to capture the living quality.

While all art is inspired by the goddess of Memory, we have not had, until Proust's *Remembrance of Things Past*, a work of art in which the process of recollection is made so explicitly and lucidly a part of the art itself. Since then, in the surrealists we have had the fragmentary and rebellious use of experiences from periods earlier in life than those that Proust recalls. However dissimilar the results, I believe the process of recollection is much the same. Schachtel describes the difficulty with which Proust recaptures the forgotten and deeply buried past; through following the clues of a sensuous memory and the threads of association around that memory, he is able to recapture what was forgotten:

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[1] Ernest G. Schachtel, 'On Memory and Childhood Amnesia,' *Psychiatry*, 10.1ff. (1947).

> He knows that as the awakening dreamer may lose the memory of his dream when he moves his limbs, opens his eyes, changes the position of his body, so the slightest motion may endanger and dispel the deep pleasure of the vision of the time at Combray recaptured by the flavor of the madeleine, or the image of Venice conjured up by the sensation and posture which the unevenness of the pavement in the court of the Guermantes' town house brought to him as the unevenness of the pavement of San Marco had years ago.[2]

Similarly, Miró describes his difficulty in recapturing memories of form. Form is difficult for him to create because he does not use 'reality'— present, active, everyday life. This he seems to be shutting out, and he seeks instead the elusive shapes which are symbols of a richer, more remote experience, indeed, of his childhood: the shapes of toys, of parts of the body, of fantastic animals, the terrors of childhood dreams. He says of his sense of form and his struggle to create form:

> I only succeeded in developing a sense of form through drawing after the sensation of thought — by feeling the shape of things with my eyes closed and then attempting to draw them.[3]
>
> Color was easy for me. But with form I had great difficulty. Pasco taught me to draw from the sense of touch by giving me objects which I was not allowed to look at, but which I was afterwards made to draw. Even today, thirty years after, the effect of this touch-drawing experience returns in my interest in sculpture: the need to mold with my hands — to pick up a ball of wet clay *like a child* and squeeze it. From this I get a physical satisfaction that I cannot get from drawing or painting . . .[4]

A shape for him is not easily seen; he must feel it. And 'feeling the shape' is, in other words, the memory of touch. He is recapturing the memory of form as he experienced it most keenly, shutting out the later culturally-determined knowledge of 'what this is for,' 'how to see,' 'how to draw.' He is trying to recapture the feeling of form, as we learn it originally, through touch. Schachtel notes that

> . . . in his (the child's) growing experience of the world around him the proximity senses have primacy over the distance senses. He tastes, sniffs and touches earlier and better than he perceives with eye and ear. In order to get really acquainted with something or somebody he has to touch it and put it in his mouth as he first did with his mother's nipple. Only very gradually and slowly does the emphasis shift from the proximity senses to the distance senses.[5]

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[2] *Ibid.*

[3] Michel Leiris, 'Joan Miró,' *Documents*, 5.263ff. (Paris, 1929).

[4] James Johnson Sweeney, 'Joan Miró: Comment and Interview,' *Partisan Review*, 15.206 (1948). Italics mine.

[5] Ernest G. Schachtel, *op.cit.* See also for interesting comparison between the use of smell and taste in the sixteenth century and the absence of these senses in favor of the sense of sight in poetry today, Lucien P. V. Febvre, *Le Problème de l'Incroyance au XVIe Siècle, la Religion de Rabelais*, Paris, 1947.

It is this *sensation* of form, this sense of touch, that Miró uses to create form in his painting. He recaptures form with difficulty, with his eyes closed. He says he has 'gone beyond form'— meaning the conventionally schematized perception of realities —'to achieve poetry.'[6]

II

IF WE EXAMINE Miró's painting we will notice a progress or evolution in his style from the 'real' forms of everyday life as conventionalized in the painting of the time to these other, for him, more real forms of 'poetry.' His first paintings are stiff, conventionally realistic, imitative of Van Gogh and postimpressionism. As he moved with the main stream of the modern French School through cubism, dadaism and surrealism, these techniques offered him encouragement in finding the poetry he sought. The experiences of his past were able to find a medium for expression that was communicable in contemporary terms, evolved from contemporary idioms.

The fundamental change that took place in his painting was in the use of space. In his early painting, we see some tampering with the rules of perspective, as Cézanne had already begun to do. The distance is brought closer. The tables or landscapes are tipped up toward the eye, intensifying, clarifying the objects, drawing them out of the context of 'reality' into some inner, more arbitrary pattern. Cubism represents the perspective of only what is within reach of the hand. It is not the depth of perspective but the depth of touch, such as the child senses when he feels the solid form of the block that he grasps in his hand. It is the sensory rather than the visual perception of form. It is the perception of surfaces and edges not only of blocks grasped in the hand but also of walls that are within reach; the child sees the walls not as they look beyond his reach, but as he perceives them when he has traveled to them and touched them. In other words, the artist, like the child, touches them all at once in his imagination.

After cubism, the next step in the use of space was as the canvas is: flat surface. Infants cry for the moon because they do not know distance. Everything is flat and in sight, or it is gone. (The important differentiation between visible objects is between those you can touch and those you cannot. For the child these are not the laws of perspective but laws of prohibition.) The artist, who uses color and line on the flat surface, in two-dimensional scale, recalls the early experiences of sight before the learning of distance through touch. He isolates, as it were, the visual experience. While Miró arrives at the sense of form through touch, he does in the final expression of form eliminate the sense of touch, and sees all objects as the child sees the moon or as indeed we see the heavens at night — in the optical illusion of the flat surface. The flat surface of the paint-

[6] Joan Miró, 'I Dream of a Large Studio,' *Exhibition of Early Paintings* (New York: Pierre Matisse Gallery, 1940).

ing does not give a place to an object in the sense that things have a place in the external world. The unity of the picture is dependent entirely upon esthetic laws, and an object exists in the picture under those laws and the laws of association in the memory. Objects, freed, as it were, from existence in a spatial world —'reality'—now exist in this 'poetry,' as Miró calls it.[7]

The process of redefining space in this way affects not only a change in the use of form and space but also in the use of color. The reaction against impressionism where color and form were identical — where color (or light) made form, and form made color (or light) — was the decisive separation of the effect of form from the effect of color. Impressionism was concerned with the effects of the present, the very immediate process of receiving impressions. The reaction to this in cubism and surrealism was to shut out the present, except in so far as it sets in motion recollections of the past, to recapture experiences and distant memories reaching back, indeed, to our earliest perceptions. And, because of the very difference in the original sensuous perception of form and color, their functions in painting became separated. Rimbaud expressed this in *Sonette de Voyelles* where he compares colors to vowels and lines to consonants. Color, he says, is the emotional body of sound contained within the consonants or lines. Indeed, our perception of color is a more direct experience than the perception of form. Color is almost active. It comes to us, hits us, while form we must learn to follow with our eye and our sense of touch.[8]

Miró, sensitive to this difference, finds color easy to handle. Color does not stand for anything. It is very simply color. The relations of colors, like the relations of objects in his paintings, have no conventionalized scheme. The relationships are in the memory and in the senses. When Miró, for instance, finds a bright colored cardboard, this suggests to him something he can do with it — it sets in motion a train of feelings and associations. Or he spills color on the paper, and, without conscious direction with his brush, watches the image take shape:

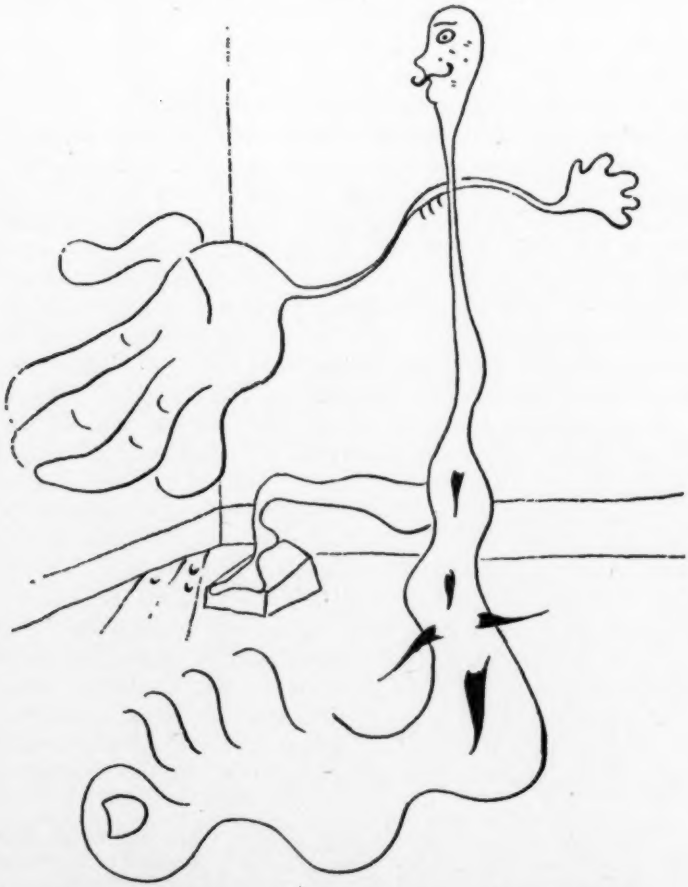
> Forms take reality for me as I work. In other words, rather than setting out to paint something, I begin painting and as I paint the picture begins to assert itself, or to suggest itself under my brush. The form becomes a sign for a woman or a bird as I work.[9]

The color comes first and seems to arouse the creative impulse. Miró's clear and brilliant pigments are striking. His use of color is, I think, an index of his state of mind. The pictures of the most brilliant color are the most positive expression. The pictures of pale color or no color at all were done in times of want, fear, sorrow, and retreat from the world. Such direct relation between

[7] For a presentation of the semantics of non-identification, see S. I. Hayakawa, 'The Revision of Vision: A Note on the Semantics of Modern Art,' *ETC.*, 4.258 (1947).

[8] Ernest G. Schachtel, 'On Color and Affect,' *Psychiatry*, 6.393 (1943).

[9] James Johnson Sweeney, *op.cit.*



JOAN MIRÓ: Statue. 1926. Charcoal Drawing, 24½ x 18¾ inches.
Museum of Modern Art, New York.

color and state of mind is the kind of direct relationship that children's use of color has to their moods.

The limited number of forms that he uses, like the child's limited number of toys and dreams, finds an infinite number of meanings and expressions. From the early pictures where much is repressed, Miró moves towards the 'poetic' reality where less and less is repressed, where forms show the free interchangeable and often frightening meanings that they have in childhood. The forms lose a part of their identity and become variations of certain Ur-forms which have

a special meaning for Miró. His imagination, like a child's, uses all the possibilities of these forms, and *plays with* them. For example 'The Farm' (1921) is a painting that contains many of the Ur-forms in their natural setting, the ox's horns appear on the ox's head where they belong. They are part of a peaceful, pastoral picture, suggesting fertility. In later paintings they appear as symmetrical arms. Sometimes they have hands, sometimes they have not. As arms they are more consciously weapons, more bull's horns than ox's horns. In the 'Portrait I' (1938), one horn is the delicate point on which the lopsided head precariously rests. The other horn is the arm. This is frightening. The head might easily fall, or is it being pierced by the horn? One arm alone suggests that something has happened to the other. In 'The Reaper,' a mural (1937), the horns are not only the arms but the sickles also. In some of the 1944 lithographs the horns have eyes on them, a development of the tree form in 'The Farm' where the holes of the sawed-off branches look like eyes. The furrows of the plowed field in 'The Farm' become in later paintings a sawtooth design, sometimes the teeth of frightening animals, sometimes a scribble. The letter *M*, the artist's initial, the first letter he learned to form, no doubt, is similar to the sawtooth design, many *M*'s strung together. This is a child's device of incorporating himself into the picture. *M* also forms the hand in some pictures, the black fingers ('Face with a Glove'). The hand, with large but too few fingers, and the saw-tooth are dangerous, sharp protusions with frightening meanings. Miró is conscious of his use of repeated forms and why he uses them, for he says:

> Three forms which have become obsessions with me . . . : a red circle, the moon, and a star. They keep coming back, each time slightly different. But for me it is always a *story of recovering: one does not discover in life. . .*'[10]

And this indeed is the secret of his art as it is of Proust's.

III

TWO FUNCTIONS of art, the creative lyrical function, springing from the joy of perception and a technical mastery of expression, and the magical function, springing from fear, are very evident in the painting of Miró. Sometimes they exist separately in different works; in his best they are both present. In the entirely lyrical pictures Miró uses a free and wandering line. I do not think it is too far-fetched to compare it to the aimless line of the child who draws such a wandering line and wonders then what it looks like, giving it a name afterwards. In Miró's pictures of this type, 'The Lasso,' the circus paintings, 'Face with a Glove,' a few rhythmic lines organize a whole canvas. These pictures have a great deal of motion and freedom and give the impression of being done almost in one gesture. Is it far-fetched also to suppose that the sensation of large and free motion of such drawing evoked in the artist (as Proust describes sensa-

[10] *Ibid.*

tion as having the power to evoke) the memory of a similar sensation of drawing in childhood, and that this sensation helps to recall the delights of mastery as well as the ambiguities and fears that the child knew?

Miró, like the child, when drawing something new, makes it large and out of proportion. For instance, when drawing a foot it is very large. The rest of the body and the other foot are insignificant. There is only a suggestion of the person attached to it. The foot is drawn, mastered, perhaps for the first time (for Miró, of course, in a new context). Both the child and the artist delight in the mastery of a shape. But, we ask, why has he chosen to draw a foot? Does the large foot of someone threaten to hurt him? Does he hope to ward it off by the magic of creating it? And does he represent it in this way without another balancing leg, without arms, without intelligence, indeed, as a *thing,* in order to express something more frightening than a foot, or possibly to render it harmless, impotent? Miró draws a large foot or a large hand, savage faces, open mouths with teeth, but at the same time gives these creatures fishlike, birdlike heads with no room for a brain. They are frightening yet harmless. A monster slinging a stone at a bird is not hurting it, for the bird is only a toy one.

Miró experiments with likenesses as children do. When a child remarks that a flower looks like a bumble bee, it is his attempt to put things into families, categories, the only kind of scientific categorization he is capable of. Miró does this with a different intent. He draws flowers and insects and then sees that they look like other things. He sees that a round insect with legs looks like the 'picture of the sun,' like a head, like a pincushion. A starfish looks like a star. Feet look like roots, like a fish tail. An egg looks like an eye, a head. Kites on strings look like heads, like pendulums. A string looks like an umbilical cord, a lasso. A windsock looks like an arm, an eel, a phallus. People look like fish, sea anemones, and so on. From these magical likenesses come magical powers. Indeed, his use of objects as symbols instead of as 'realities' shows his power over them. He can make them into what he wants. He, so to speak, casts a spell over the evil of the 'real' counterparts. It is interesting that while these are the conscious methods of art, with children such pictures would represent unconscious associations and an unconscious acting out of fears. Miró's recollection of childhood experience certainly includes much of the child's unconscious expressions of fear but at the same time he gives them a conscious and sophisticated meaning. In consciously seeking to recollect the 'feeling of the shape of things,' he makes the sensuous associations not of the child but of the artist.

There are periods in the work of Miró where his fears seem to dominate his work almost like an obsession. In 'Harlequin's Carnival,' for instance, and many black and white and sepia drawings of that style, we see stiff, geometrical, precisely drawn objects: wheels, ladders, pendulums, toys, windsocks, insects crowded together on the page, giving one the feeling of confusion, fear, frustration, anger. Miró did these pictures at a time when he was near starvation. He

says that at the time he painted 'Harlequin's Carnival' he used to lie in bed and bang his head against the wall. May not this headknocking, which little children indulge in as an expression of frustration and impotent anger, be a heuristic device similar to Proust's method of recall through sensation, in this case to recall childhood experiences of frustration, fear, and anger so remarkably shown in these pictures? These pictures, so lacking in warmth or emphasis, indicate a kind of bare subsistence in the emotional sense. To be sure, he could afford few materials and had to crowd all he could onto one surface, but there is more expressed here than simply scarcity of materials. The child who is frustrated, and who does not know how to enjoy what he has, views things with equal desire, indiscriminately. He does not make choices but wants everything. Miró suggests to me here the hoarding child who is by temperament fearful of losing anything. He clings to all his possessions not because he loves them, but for fear of losing them. These pictures, so crowded, so lacking in focus or differentiation, so pale in color (many in this vein are black and white or sepia) show this fearful and hoarding quality. The precise and geometric drawing seems to express the forcible possession of objects rather than a loving or caressing of them. In the black and white lithographs done later during the war there is some of the same feeling of deprivation and fear; but these are done with a different affect: this time not so much with a desire to possess objects as to cast a spell over the forces of evil.

When the immediate experience of hunger (or the experience of living through the war in refuge) was past, the artist was able to remove himself from the obsession that these experiences had for him and to create pictures that are a less direct result of obsession; while these same little objects appear in 'The Potato,' for instance, they no longer cover the whole page, but form a part of a large composition, a *remembrance of the obsession,* a form in itself very frightening, but not obsessive. The little objects in these pictures have a place and a meaning within the larger constellation of the composition. While using many of the same objects of his obsessions, he creates something here quite new, a monumental composition.

IT IS CLEAR in the work of Miró and of many other modern painters that the sources from which they gain their insight and have their inspiration lie in the psychosomatic existence, as Schachtel describes it. Western art has developed from the most impersonal and general symbols — that is, the religious symbols in Byzantine and medieval art — toward a more and more personal and individualized experience and set of symbols. From the religious it moved toward the secular and realistic, then toward the sensuous and romantic, then toward the impressionist, and now simultaneously toward the conceptual (abstract) and the art of memory and dreams. In other words, the change has been from 'objective' art to 'subjective' art as the individual has become more and more con-

scious of himself. Since the formative life of the individual occurs in childhood, it is in this part of his life that the artist, turning to the subject of the indiidual, seeks out the richest material. According to Proust, as Schachtel observes, the more deeply buried an experience is, the more brilliant it appears upon discovery. It is untouched, isolated, and still exists in the aura of its original sensory and emotional context. To be sure, Proust does not confine himself to experiences of childhood alone in *Remembrance of Things Past*. Miró, however, does concern himself almost exclusively with subject matter related to childhood and the remote past and to the quality of experiences that we can recognize as unschematized, typical of very early experiences. This is perhaps his limitation, and yet it is that unschematized quality of experience, with its peculiar childish brilliance, freshness, wit, fear, and lyricism, that we recognize and find pleasure in.

I have stressed in Miró the qualities characteristic of childhood and of things remembered of childhood. But these qualities are not to be confused with the work of children. The skilled hand of the artist does not forget. The stages through which the artist has passed to reach this operation remain in the skill of the operation, in what has been learned, and what has been chosen and developed in the technique. To put into adult terms not only what has been forgotten by the adult but what was for the child an inarticulate experience is the task that Miró seems to me to be accomplishing.

> The head that spoke the word came more and more to dominate the whole body. The word as the mere symbol of behavior became supreme. And as man tended increasingly to live in his head, in his word alone, whole motivation and outlook were forgotten. So that slowly and without our knowing it, communication by means of the head and its word came more and more to crowd out the primary principles of whole living.
>
> TRIGANT BURROW, *The Biology of Human Conflict*.

THE NERVOUS SYSTEM AND GENERAL SEMANTICS:

III. *Perceptual Response and the Neurology of Abstraction*

RUSSELL MEYERS, M.D.*

IN OUR LAST communication an attempt was made to reach a formulation regarding 'reality' and 'unreality' which might meet the operational requirements of general semanticists and of scientists in general. A consideration of certain experimental findings which appeared particularly relevant to our inquiry led to the suggestion that *we take to be 'real' that to which we have developed relatively adaptive behavioral patterns of response.*

The potential utility of this hypothesis is appreciably expanded by the adoption of the view that language of both the vocal (explicit) and subvocal (implicit) varieties is one of the behavioral patterns of response referred to in our formulation which may (or, more accurately, *sometimes* may) be said to possess 'relatively adaptive' value. Language behavior in this view differs in no essential respects from other explicit and implicit sensori-motor activities of head, hands, heart and heels serving the needs of the organism.

Our tentative formulation possesses at least one virtue to commend it to the attention of the general semanticist: it is cast in such terms that its validity may readily be measured against the familiar yardsticks of *predictability* and *manipulability to* (seeming) *advantage*. As we have seen, the formulation involves the *perceiving organism* quite as thoroughly in the account of 'reality' and 'unreality' as it does the *object* said to be perceived. Accordingly, our investigation into its validity is facilitated by a preliminary inquiry into the nature of 'perception' as a bio-psychologic process. Such a digression, besides serving a number of interests consistent with our primary goal, promises to

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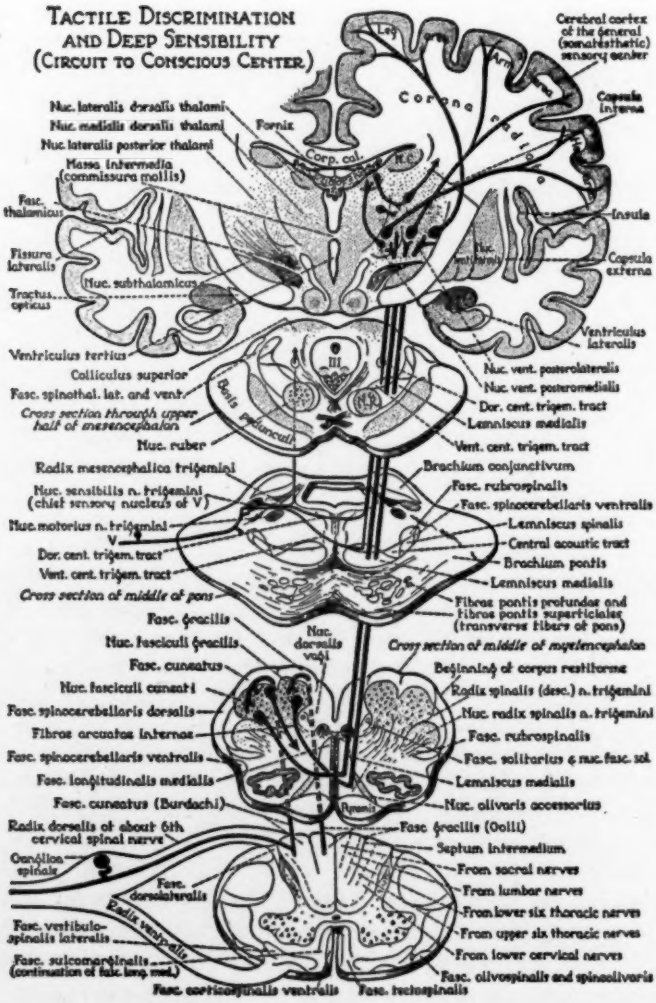


FIG. 1. A typical diagram from a currently used neurologic text (A. T. Rasmussen: *The Principle Nervous Pathways*, 2nd ed., copyright, 1941, by the Macmillan Company and used with their permission and Dr. Rasmussen's) (37), showing the failure to distinguish in the manner of labelling between factual and hypothetic considerations. The reader's attention is directed to the terms 'circuit to conscious center,' which the diagram as a whole purports to represent, and 'cerebral cortex of the general (somatesthetic) sensory center.'

illuminate to some extent the neurologic meaning of a term oft-encountered in the idiom of general semantics, namely, 'abstraction.' In addition, it promises us an opportunity to examine two of the sixteen 'bed-rock terms' which engaged attention in our first communication (24), namely, 'cerebral centers' and 'sensory and motor cortical functions.'

At the outset of our inquiry regarding perception, it is necessary to take notice of a circumstance which, when stated in so many words, will probably be accorded prompt acknowledgement by most philosophers, psychologists, psychiatrists and neurologists. It is this: that the term *perception* carries with it a predominantly if not indeed a strictly *sensory* connotation. So axiomatic does this proposition appear, so universally has it been received throughout the centuries as a necessary basis for serious discourse, it may be wondered why attention needs to be directed toward it at all. But as we have already observed, the history of astronomy, physics, geology and science in general reveals a number of propositions, aphorisms, and the like which at one time or another were regarded as 'selfevident truths.' Many of them have been subjected to severe revisions and not a few have had to be abandoned. We are reminded of an incisive remark bearing upon a somewhat related matter made over a half-century ago by Thomas Henry Huxley (16).

> The popular classification and terminology of the phenomena of consciousness . . . are by no means the first crude conceptions suggested by common sense, but rather a legacy, and in many respects, a sufficiently *damnosa haereditas*, of ancient philosophy, more or less leavened by theology; which has incorporated itself with the common thought of later times, as the vices of the aristocracy of one age become those of the mob in the next. . . . And the first business of the student of psychology is to get rid of such prepossessions.

It appears highly unlikely that we shall ever arrive at any very dependable knowledge concerning the origins of the notion that perception is essentially a sensory process. We may indulge if we please in wide speculation upon the matter, but this much at least is apparent: that whatever the prevalence of the notion, it was *not* established by the exercise of rigid scientific method comparable to that regularly insisted upon today in consideration of propositions of far less fundamental character. Like Topsy, it appears to have 'just growed.'[1]

[1] Aristippus (425—*ca.* 366 B.C.), the founder of the Cyrenaic school, taught that our knowledge is restricted to sensations and, with but minor reservations, the Stoic and Epicurean schools which followed him subscribed to the dictum, *nihil est in intellectu quod non fuerit prius in sensu.*

The modern form of the doctrine of 'sensationism' is generally ascribed to Thomas Hobbes (1588-1679). In effect, it holds that all knowledge originates in sensations and that all cognitions, including perceptions, reflective ideas and intuitions, refer ultimately to elementary sensations (3). Prior to Hobbes and for a full century after him philosophers used the term 'perception' in a rather nebulous manner. John Locke

II

THE ANCIENT emphasis on the essentially sensory nature of perception, whether overtly expressed or covertly exercised, can be amply illustrated by reference to the accounts offered by more recent psychologists. 'Always and everywhere,' declared Titchener (39), 'we must explain perception in the light of sensation. . . . It is sensations that fit together in a pattern, sensations that are substituted for one another, sensations that form the cross-country tracks when the highway has proved too roundabout.' The concept thus expressed will be recognized as a special case of the more general postulate of the 'structuralistic school' of psychology: that there are certain ultimate 'psychic elements' called 'sensation' and that the 'whole fabric of cognitive consciousness is built up by compounding these in more or less complex forms.' There is a hint in at least one of his writings that Titchener, though an ardent champion of structuralism, vaguely felt that the proffered account did not and perhaps could not fulfill all requirements. In his *Primer of Psychology* (40) he appears to have been groping for a supplementary factor and to have come up with a piece of word-magic. 'Perceptions,' he said, 'are . . . groups of sensations which are held together by the command of nature.'

Howard Warren likewise lent his authority to the structuralistic doctrine. He was inclined, however, to delimit the sensory field that might be involved in perception to the 'external senses' *(e.g.,* sight). 'The first step in the growth of cognitive mental states,' he contended, 'occurs through the union of simultaneous sensations into single unitary experiences. These states are known as perceptions.' (43) 'Perception is the grouping together of various external sensations into a single united experience.' (44)

(1632-1704), for example, and David Hume (1711-66) frequently employed it synonymously with 'cognition' and 'consciousness.' Von Leibniz (1646-1716), however, strove for a more definitive account. He spoke of 'sense perceptions which depend upon direct excitations of the organs of sense.' A still further refinement of meaning was attempted by Immanuel Kant (1724-1804). 'Sensation,' averred Kant, 'is the actual affection of our sensibility or capacity of receiving impressions by an object. The perception which refers itself to an object through sensation is empirical perception.' (45)

Among English students of 'mental philosophy,' Thomas Reid (1710-96) appears to have been the earliest to draw a sharp distinction between sensation and perception. For him, sensation consisted in 'a subjective state produced by an external stimulus,' 'a certain kind of feeling due to an impression on the organs of sense.' The term sensation did not necessarily imply 'awareness' of the object. Perception, on the other hand, implied awareness of an object by means of a present sensation (4). It remained for the philosopher, George Lewes (1817-1878) (22), to formulate an account generally acceptable to students of psychology of the late portion of the 19th and first portion of the 20th centuries. Lewes spoke of perception as the 'synthesis of all the sensations we have had of the object in relation to our several senses' and thus introduced the notion of *sensory fusion,* a concept which enjoys considerable esteem in the areas of genetic and physiologic psychology.

Convictions comparable to the above and ranging from the beginning of the current century to the year 1947 (5, 10, 15, 17, 18, 21, 26, 35, 36, 46) might be cited at considerable length. Such documentation however could not point up more eloquently the prevalence of the traditional 'sensory' thesis concerning the nature of perception than day-by-day communication with one's colleagues; and at this point our purposes will have been effectively met if the reader has arrived at a realization of the obscure origin and arbitrary character of the generally endorsed account, regardless of whether it be cloaked in structuralistic, gestaltist or less formal psychologic raiment.

For almost twenty years a more dynamic, situationally useful and operationally amenable view of the nature of perception has been represented in certain psychologic writings (6, 27, 34, 41, 47). A brief allusion to this was made in our second communication (25) and we shall presently return to a more detailed examination of it. But having taken notice up to this point of the psychologic account only, we shall find ourselves at some advantage to take similar notice, before proceeding further, of the neurologists' views concerning the nature of perception.

III

THE NEUROLOGIC accounts, like the psychologic, appear for the most part to follow the lead long ago set by the natural philosophers. In general, neurologists appear to have exhibited somewhat less interest and initiative in the formulation of a useful view of perception than many of their colleagues in the psychological area. A survey of the pertinent neurologic contributions discloses little more than a filling-in of certain gaps in the classical account with factual details. No new principles appear to have been added and the age-old pursuit of the sensory components, leading deep into the marshes of obfuscation, is once again recognizable in an otherwise sound monograph on the subject recently prepared by the British neurophysiologist, Adrian (1).

On occasion, the eager young student of psychology hopefully turns to neurology for more precise knowledge concerning the 'neural substrate' of perception—perhaps of the phenomena of consciousness in general. Upon first encounter, he is likely to be fascinated by the apparition of ardently-sought tangibility conjured up by the neurologist; he is almost certain to be profoundly impressed by the welter of microphotographic illustrations, kymograms, electrograms and diagrammatic representations of neural pathways and nodal points which years of painstaking research into the minutiae of neuroanatomy, physiology, biochemistry and pathology have made possible (Fig. 1).

Unfortunately, however, disillusionment must follow this initial phase of fascination. As his contemplation of the neurologic accounts becomes more sober and as his capacity for critical evaluation grows, the student discovers to his dismay that while the ground he has been treading has been solid enough

up to a certain point it breaks off before him quite suddenly, so that instead of grasping the elusive objects of his initial inquiry he discovers himself staring into the same abyss of metaphysical dualism which he had but recently viewed from the vantage point of mentalistic psychology.

Let us pause long enough to identify the chief characteristics of such neurologic accounts and to envision in semantic terms how the illusion of tangibility must have been created for our eager young student. The diagrams, their accompanying legends and the corresponding textual material commonly exhibit two components: (a) the symbolic, spatially-circumscribed representation of a large number of valid facts, mainly concerning nerve pathways, cellular aggregations and directions of propagated neural impulses; and (b) the symbolic and comparable spatially-circumscribed representation of a sort of 'psychologic distillate' resulting from, or produced by, the activity of the cellular aggregations referred to under (a). The distillate is variously labelled 'consciousness,' 'perception,' 'sensation,' 'conception' and what not. Unfortunately for the student, the devices adopted by many neurological writers for representing these two components, (a) the factual, and (b) the highly inferential (and often unsupportable), do not reveal the disparities that actually obtain between them. In figure 1, arbitrarily selected from a widely-used textbook (37) as illustrative of the point at issue, the *cortical 'conscious center'* of tactile discrimination and deep sensibility is labelled in a manner quite indistinguishable from that by which the *brachium conjunctivum* and the *capsula interna* are designated. As a consequence, the halo of prestige which deservedly surrounds the factual component diffuses insensibly before the eyes of our impressionable student and comes to encompass also the inferential. By such means the traditional account of the nature of perception, cognition, consciousness, etc. may receive pedagogic reinforcement. In the words of one neurologist,

> The cortex situated behind the motor area of all lower animals can be looked upon as a generalized sensorium reached by four streams of sensory fibers coming from the thalamus. . . . In the Primates . . . the primary sensory areas have become surrounded by bordering zones of differential cortex which stand in immediate functional relations to the sensory area. These have been called psycho-sensory areas . . . the sensory areas are in immediate connections with these surrounding areas by means of short association fibers and by direct cortical continuity (28). The process of registering sense impressions in the cortex is perceiving. Perception is doubtless [sic!] a configuration of patterns of brain waves spread through wide pathways of cerebral tissue between the sensory areas of the cortex. The configurations coming from the sensory areas fuse at many points and in many ways to become total patterns (29).

A degree of authenticity is lent to the author's contentions concerning

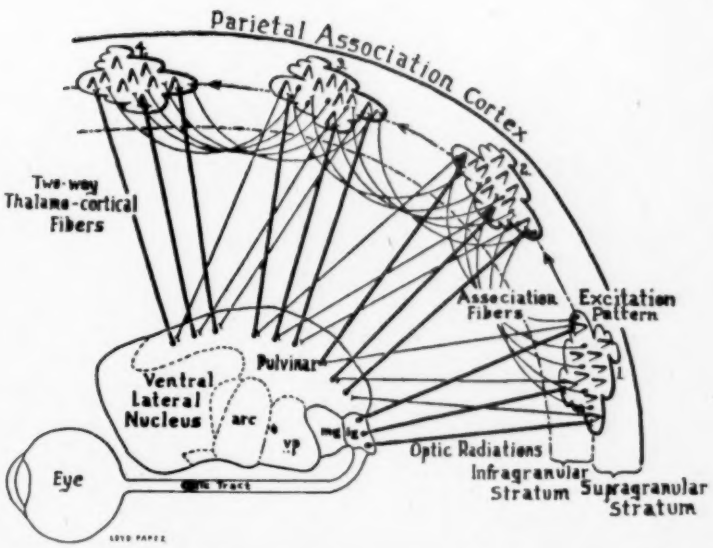


FIG. 2. (From J. W. Papez: *Human Growth and Development.* Copyright, 1948 by The Cornell Cooperative Press and used with the permission of Dr. Papez) (29). The legend accompanying this figure reads as follows: 'The figure shows a visual pattern arrived in the visual area and there emblazoned as a configuration. This configuration moves from the sensory area through the parasensory area, the perisensory areas and then through the parietal gyri.'

the manner of spread (or irradiation) and fusion of sensory excitation patterns in the brain by a series of ingenious diagrams (29, 30, 31) of which two are reproduced here (Figs. 2 and 3).

The veridical character of the *anatomic* structures represented in these diagrams can scarcely be challenged. It is the *functional representation* of the process of electric wave 'irradiation' and its direction; of the two-way repercussions of neural impulses between the cortex and the thalamus (the pattern of the first 'supporting' the second, and vice versa); and of the process of 'fusion of configurations,' which is virtually completely hypothetical and which therefore calls for comment. In the author's words, 'The figure shows a visual pattern arrived in the visual area and there emblazoned as a configuration. This configuration moves from the sensory area through the parasensory area, and perisensory areas and then through the parietal gyri. Here it fuses with configurations which may be coming in other directions from the other sensory areas. A number of primary configurations may thus meet along various gyri and fuse. This is perception.' That all this is largely fictional is not apparent

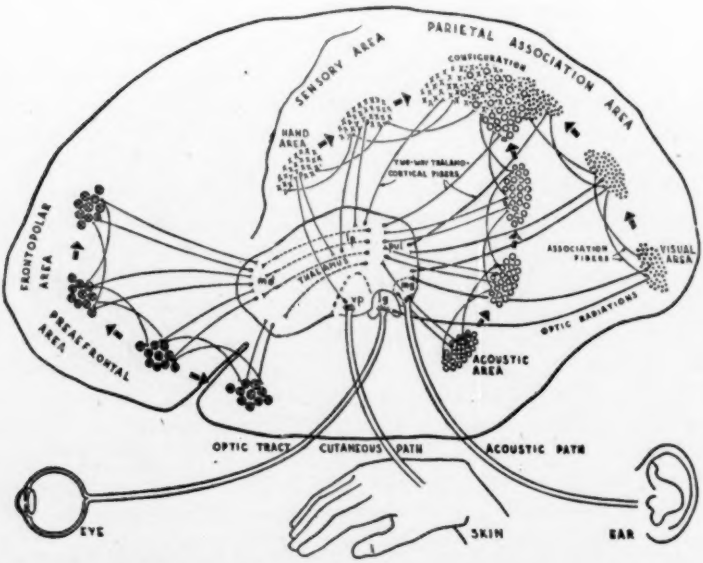


FIG. 3. (From J. W. Papez: *Human Growth and Development.* Copyright, 1948 by The Cornell Cooperative Press and used with permission of Dr. Papez) (29). The legend accompanying this figure reads as follows: 'This figure shows the outer surface of the left hemisphere. On it are indicated the location of the four main sensory areas and the direction of the excitation processes through the connecting gyri and their fusion to form a configuration.'

to the uncritical student for whom the verbs, 'moves,' 'fuses' and 'is,' may seem to possess the same ring of conviction as that which attaches to the verbs in such relatively 'extensional' sentences as 'The sensory areas have a line or stripe of fibers in the middle of their cortex (line of Gennari and Vicq d'Azyr). These fibers connect all parts of the sensory area with all other parts of the same area.'[2]

[2] This circumstance is not mitigated by the occasional use of the verb, 'may,' as in the sentence, 'Excitation patterns may, therefore, spread or irradiate by association fibers and by cortical contiguity.' Unless the author takes pains to clarify his meaning, the reader may interpret it in one of two ways: (a) in a guarded sense, meaning 'perhaps' or 'possibly'; or (b) as equivalent to the verb 'do,' but implying the existence of an alternative. The general semanticist refers to such terms as 'multiordinal' and recognizes the semantic dangers that may inhere within their employ.

It should be understood that neither the intentions of the authors cited above nor their personal integrity are herein brought under question. The selection of quotations and of illustrations from among a large number of similar representations in the literature,

FIG. 4. A photograph of the technic now employed in several neurosurgical clinics for picking up the electric potentials (corticograms) of the exposed human brain. The patient is lying face up and portions of the left and right frontal lobes lie exposed. The dura mater has been 'rolled up' toward the midline between the hemispheres. Ten silver ball pick-up electrodes are applied to various portions of the cortex. Slight movements of the brain, such as the respiratory and circulatory pulses, are 'taken up' by coiled springs along the shafts of the electrodes. The electrical currents are then transmitted along the braided wires to a multi-channel electroencephalograph.

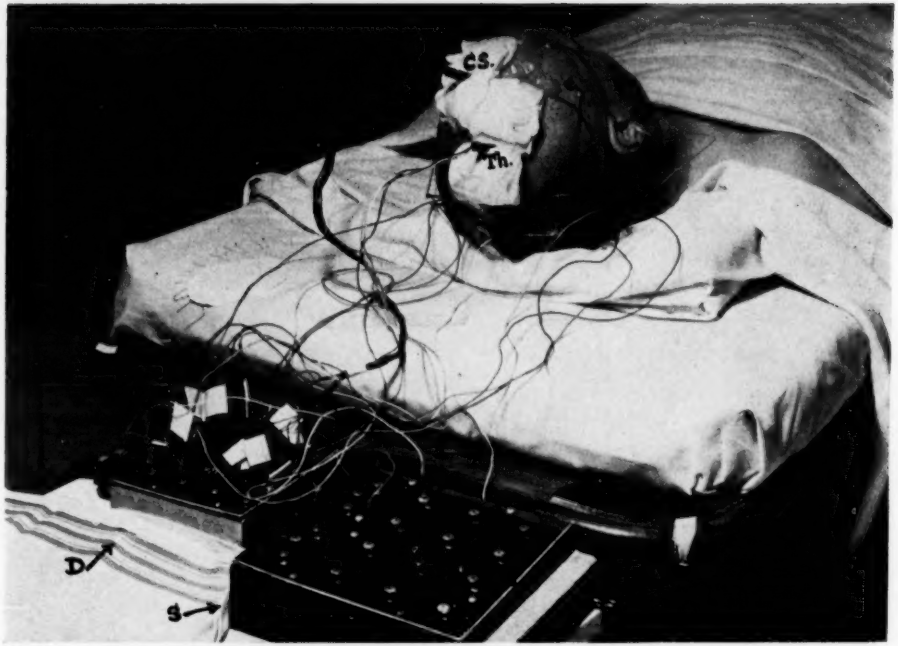


FIG. 5. Experimental set-up for direct recording in the unanesthetized subject of the electric potentials of the thalamus and corpus striatum simultaneously with those from the cortex as transmitted to the scalp. CS = hub of the electrode shaft inserted into the corpus striatum through a burr hole in the skull; Th. = hub of the electrode shaft inserted into the thalamus through a second burr hole; c,c = electrodes on the scalp surface; re = reference electrode attached to the ear. The switch boxes for the deep (D) and surface (S) electrodes are seen in the foreground. The patient can be instructed to open or close the eyes, to talk, move, do 'mental' arithmetic, etc.

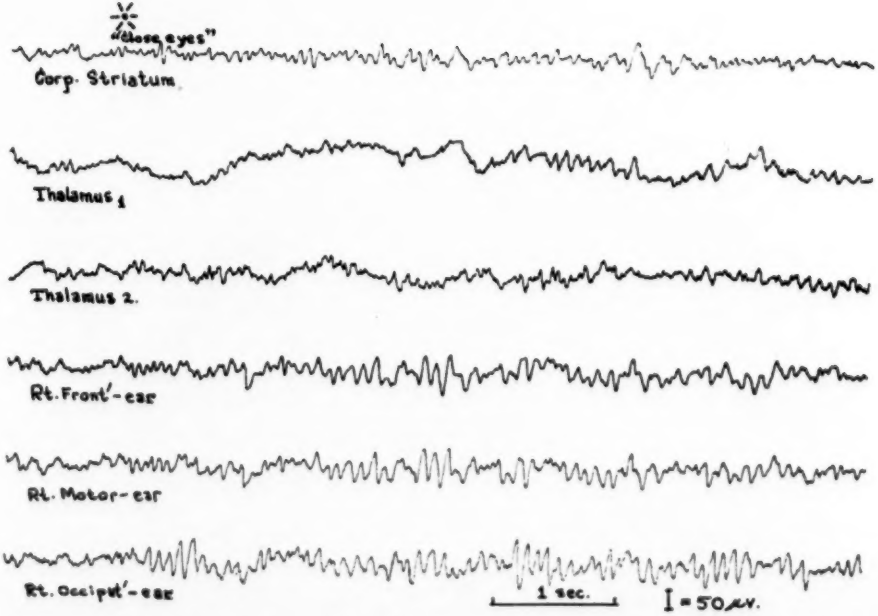


FIG. 6. Bipolar electrograms from the corpus striatum and from two nuclei of the thalamus (that labelled 'Thalamus 2' is in the pulvinar) simultaneously recorded with monopolar electroencephalograms of the cerebral cortex. At the signal 'close the eyes,' the 8-10 per second alpha rhythm, wholly in abeyance while the eyes are held open and the patient is perceiving a criss-cross pattern on the ceiling, promptly reappears in the leads overlying the occipital (visual) cortex. At virtually the same time the alpha waves appear in recordings from leads overlying the 'motor' and frontal areas of the cortex. The electrogram from the pulvinar (Thalamus 2), however, does not reflect these cortical changes in electric potential.

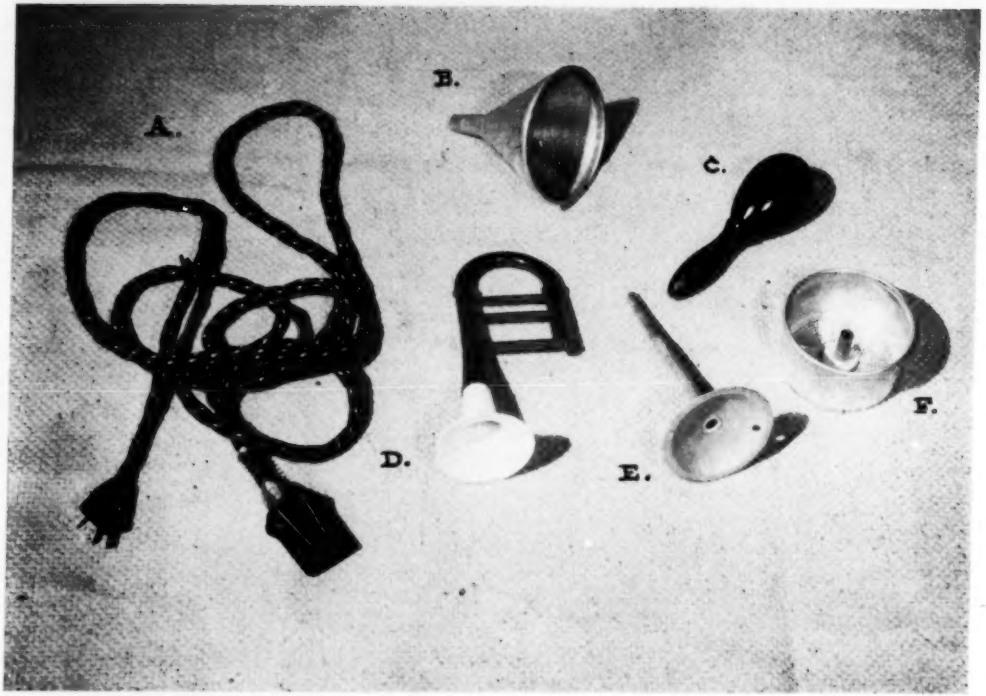


FIG. 7. A series of articles to which a female child of 22 months consistently responded *as if* dealing with a telephone receiver. A = cord and plug of an electric iron; B = funnel; C = darning 'egg'; D = toy trombone; E and F = assembly parts of a coffee percolator.

SUBSTANTIATION of the foregoing or of any similar neurologic account would require at the very least the setting up of a formidable experiment. The unanesthetized animal (preferably the human, from whom proper cooperation including the giving of verbal reports might be obtainable) would need to be studied under relatively controlled conditions in which (a) a well defined and modifiable process of 'perceiving' is evoked at the same time that (b) multiple electric potentials from all critical parts of the brain are recorded. The recordings would have to be made in such a way that (c) precise time relations of the numerous electric potentials are ascertainable. The pickup electrodes would need to be accurately placed—presumably by means of a stereotaxic instrument standardized for the human—on or within the following structures: the several 'sensory projection areas' of the cortex, their subjacent 'U'-fibers, the long 'association tracts' of the hemispheres and the thalamic nuclei anatomically related to the 'sensory' and 'association' areas. While it is true that a technic which may make this procedure possible is gradually being developed in several neurosurgical clinics (Fig. 4), no such experimental attack as that outlined above has thus far been attempted. And until it has, any endeavor to fashion an account of perception in neurologic terms must remain highly conjectural, resting for its chief support upon anatomic data and to a lesser extent upon pathologic data (much of which is of a self-contradictory character), supplemented by a modicum of physiologic suggestions derived from an analysis of strychnine-reinforced spike potentials ('functional neuronography') (8). Regarding such neuro-anatomic, -physiologic and -pathologic material, our present-day concepts are not so substantial but that we must anticipate the possibility of being misled by their incorporation in our formulation of perception. Certainly, the particular temporal relations of migrating patterns so crisply depicted for the reader have not been demonstrated. Such meager data as are now at hand appear to controvert that aspect of the account proposed by Dr. Papez which bears upon the two-way reciprocity of cortical and thalamic wave-patterns. In a series of experiments on cerebral sleep potentials conducted by the present writer and collaborators (20), electrograms were recorded in the unanesthetized human from the scalp surface in the neighborhood of the cortical visual projection area simultaneously with those from the pulvinar of the thalamus—a visual 'relay-nucleus' anatomically related to the visual projection area of the occipital cortex. The locus of the thalamic electrodes was ascertained by pneumoencephalographic X-rays. In one case it was possible to confirm the locus after death

any of which might have been selected, was necessarily arbitrary and intended to serve no purpose other than that of proper documentation. What we are primarily concerned with is the *semantic effect* produced in the impressionable reader by improperly used symbols (whether pictographic or verbal) and with the reciprocal reinforcing effect played back upon a given doctrine which enjoys the student's uncritical endorsement.

by coronal sections of the brain. Under conditions in which the subject (a) held the eyes closed and (b) opened them to contemplate a criss-cross pattern on the ceiling, the appearance and disappearance of the cortical 'alpha-waves' were *unaccompanied* by any discernible alterations of the prevailing wave patterns derived from the pulvinar.

It is perhaps not to be wondered at that the student, after faithfully covering a considerable portion of the territory of neurology in anticipation of reaching a palpable account of perception, appears somewhat 'let down' by the concluding formulations proposed for him by the neurologist: 'The conscious accompaniment of this cortical excitation is commonly called a sensation . . . if it is a pattern of activity coming from some object, then the complex sensation is a perception . . . for it is well known that the mental images correspond closely to immediate sense impressions' (29). With such dualistic formulations ('conscious accompaniment,' 'sensation,' 'complex sensation,' 'perception,' and 'mental images') the student is returned abruptly to the point from which he first embarked. He may well reflect that if this is the stuff from which perceptions are fashioned, then, except for his own highly fallible introspections, perception must forever remain a *private* matter, inaccessible to palpation and beyond scientific manipulation. Certainly no subhuman animal, however carefully studied, will ever yield data of the necessary sort; and among his fellow humans, only those whose available time and services he can enlist may be studied. Even with the latter he is severly handicapped, for he must in any case depend largely upon verbal reports—behavioral phenomena in no sense identical with perception as he has come to regard it—and allow for the same fallibility of introspection to which he himself is heir.

A further perplexity confronts our student. He has been instructed that the building blocks of perception are in the nature of *sensations*. Sooner or later, however, he is bound to discover that the latter are in no sense a 'fact of experience,' but a mere 'construct,' even farther removed from his introspective experience than the percepts themselves. 'There are,' says Henry Head (14), 'no physiological activities corresponding to "primary" sensation. The afferent impressions produced by the actions of an external stimulus are highly complex, and are subjected to the integrative action of the central nervous system, before they can become fitted to subserve sensation. Qualities such as pain, heat and cold are abstracted from the psychical response and spoken of as "primary sensations," but they have no physiological equivalent in vital reactions of the peripheral mechanism. A "primary sensation" is an abstraction.' This disclosure is bound to be disconcerting to the student, for what it amounts to is that sensation, an inferred construct, derived in the first place from perception, has been employed to bolster the account of perception itself!

Finally (our student observes), the specific character of the process of 'fusion' ('synthesis,' 'integration,' 'association,' etc.) remains unexplained and

poses in its own right problems for him in no wise different from the problems that confront those of us who attempt to use the classical map in traversing clinical neurologic territories (23).

The dearth of our present knowledge relative to the neurology of perception has been recently remarked upon by Adrian (2). 'When the brain is alert,' he says, 'the sensory pattern formed in the receiving area must be capable of influencing other parts of the brain, but we have little knowledge of the way in which this influence takes place . . . though we may know what (anatomic)[3] connections exist, we cannot yet follow up the effects of a sensory pattern, whether a spatial pattern of cell excitation in the visual area will be handed on to form a similar pattern in some other region or whether the messages which leave the receiving area will be cast in some entirely different form.' Here is a statement which, however regrettable the circumstances that impel it, is factually correct.

It is in no sense the intention of the present writer to protest against the business of drawing inferences or the employment of what is called imagination in the erection of hypotheses. Such exercises appear to be not only desirable but indispensable to continuous systematic advances in the sciences. Objections are in order only when authors fail to represent inferences and hypotheses unequivocally for what they are and when they permit themselves, after countless reiterations of their hypotheses, to write about them in a manner which admits of their being mistaken for verifiable fact.

IV

UP TO THIS POINT we have taken cognizance of the popularly-held psychologic and neurologic views of the nature of perception and have remarked upon their dubious origin and insubstantial character. That difficulties beset the traditional accounts is freely acknowledged by both psychologists and neurologists. It is generally assumed, however—even if seldom expressed in so many words—that the difficulties arise from the extremely complex and often unfathomable character of the objects of study themselves, *i.e.*, 'the mind' and 'the nervous system.' The propriety of continuing the attack as before, along fronts suggested by the fundamental postulates, is very seldom questioned.

But at least one alternative explanation of the source of these difficulties suggests itself to the general semanticist, namely, that they may stem from long-practiced language habits and prejudicial convictions operating within the investigators themselves. The general semanticist is aware that in the evolution of modern science difficulties long imputed to the nature of the 'terrain' have occasionally turned out to reside altogether with the 'map' being consulted, and that when this circumstance obtains travel may sometimes be facilitated by the adoption of a map which more closely fits the territory.

[3] Parenthetic interpolation mine.

If perception framed in sensory terms promises to remain inaccessible to us, we may raise the question whether any advantage is likely to be gained by regarding it as *a way of behaving*. In our previous communication (25) it was intimated that in the functioning individual, 'sensory components' of cerebral activity cannot be divorced from 'motor components.' Although such a separation is traditionally practiced, it is one which goes well beyond available facts. The schism takes place on a verbal level only and appears to have been supported largely by analogy with what was already known in 1821 concerning afferent and efferent peripheral nerves and spinal nerve roots. If, therefore, perception can justifiably be considered apart from the dichotomy between cerebral 'sensory' and 'motor' events generally implied in discourses on the subject; if it can be admitted as a sensori-motor process in the sense in which the modern physicist speaks of the space-time and the mass-energy *continua;* it promises to become accessible to us as an object of scientific inquiry and therefore more comprehensible than it now is. This notion, that perception can be approached as a process of response, may be formulated somewhat as follows: *Perception is a response of implicit and/or explicit character made by the organism to a part of a presenting situation as if to the 'whole' situation dealt with in previous similar experiences.* Such a formulation is intended to accommodate verbal, gestural, mimetic and comparable 'symbolic' responses as well as non-symbolic muscular and glandular activities, inhibitory responses, 'postural sets' of muscle tonus and the like, which may be evoked in a given situation.

Perception viewed in this way is a dynamic, ever-changing process—never twice the same and comprehensible only in *genetic* terms. This is to say that the perceptual response exhibited by an organism in the presence of a set of physical stimuli (the spatial and temporal inter-relationships of which constitute for that particular organism 'the present situation') is determined in considerable measure by two sorts of factors: (a) the neuro-somato-visceral traces of responses variously exercised in *previous contacts* with similar configurations of physical stimuli; and (b) myriads of intra-organic responses—some identified, others not so—made to the plenum of intra- and extraorganic stimuli prevailing at the moment and referred to in current-day psychology as *drives* and *motivations*. The latter constitute the physiologic 'background' upon which 'the present situation' (the 'figure') plays.

In figure 7 a number of articles are illustrated which were separately encountered on one or more occasions during a period of two weeks by a child of 22 months. To each of these she exhibited a similar response: the narrow portion of the article was grasped in the left hand and the wide end was applied against the left ear; the head and eyes were deviated slightly to the left, and the mouth was held partly open. The same objects were later shown to a number of adults with the request that they make some sort of response, verbal or

otherwise, which might reasonably cover the 'meaning' of all items. With one exception they reported their inability to do so.

The child's pattern of behavior with reference to these seemingly disparate objects is readily comprehensible when the fact is disclosed that on a number of occasions she had been permitted to accompany her mother to the telephone and that she had recently been permitted to hold the receiver to her own ear while she listened to her father's voice. Her behavior, evaluated in terms of our recently proposed formulation, represents a response *to a part as if to the 'whole.'* This interpretation stands in no need of alteration from the mere circumstance that the infant's repertoire of acquired responses is relatively limited; nor is it significantly affected by the fact that at some later age she may exhibit a different response than that described to these and similar objects. The intra- and extraorganic nuances to which she reacts may vary almost without limit, but whatever they may be at a given time they can represent but a part, not the whole, of the situation.

That particular component of a situation—or better, that particular *relation* of components—to which the child exhibits a perceptual response often proves to be a matter of considerable surprise to the disinterested observer. For example, a male infant of 23 months acquired and exercised a 'Choo Choo!' response to railroad trains. This verbalization appeared with fair regularity in the presence of 'real' trains, toy trains, pictures of trains and the rumbling sound alone of a passing engine. The adult observer attempting to comprehend this phenomenon might postulate that some feature of the configuration which is for him 'characteristic' is also that to which the child responds—*e.g.*, the smoke puffs, the whistle, the bell, the issue of steam, the wheels, the general shape of the engine's body, etc. But that these are not necessarily *the* features of significance for the child is convincingly illustrated by the fact that the response 'Choo Choo' was elicited by an unclasped necklace made of graduated ovoid beads lying on the table. The functional archetype of perceptual response here illustrated (principle of chain?) may be regarded as a special case of *abstraction.* It is discernible in the behavior of the adult as well as in that of the child and of the sub-human laboratory animal.

V

BECAUSE THEY manifestly run counter to long-accepted modes of teaching and communicating in the areas of neurology and psychology, the remarks recently made concerning the non-feasibility of interpreting brain function in terms of 'sensory' and 'motor' functions require some elucidation.

As we have seen, the generally embraced view of the perceptual process is that each 'sense'—vision, audition, pain, touch, smell, taste, etc.—has its own 'sensory projection area' in the cerebral cortex. The latter is presumed with good reason to be activated by nervous impulses, some of which are inherent

within the cerebral organ in the condition of repose and others of which pass from time to time from the receptor organs at the periphery of the body through a series of relays to the appropriate cortical 'center.' Here, by some means as yet unidentified, a 'sensation' appears. The latter is variously spoken of as a 'conscious' or 'mental' or 'psychic' process but in any case it is not generally regarded as identical with the physical brain events that constitute its 'neural substrate.' Now by a process of 'fusion,' the physical activities of several such 'sensory centers' in the cerebrum aroused in close temporal relation to one another become unified. Incidental thereto a new mental event—a 'perception'—is said to be experienced. Like the sensation, the latter is not regarded as identical with the physical events in the brain which 'subtend' it (32) but is spoken of as a mental process. The physical 'neural correlates' of sensation and perception are generally taken to constitute the *sensory aspects* of cerebral function.

Eventually (and usually in consequence of what has taken place in the brain up to and throughout the development of a perception) the 'motor centers' of the brain may become activated, in which case some 'voluntary' or 'involuntary' muscular response is demonstrable. It is important for us to note at this point that, on the classical view, the muscular response is in no sense an inevitable consequence of perception; it is looked upon as a *sequel to* rather than an *integral part of* the perceptual process. Thus, in Gates' (13) words, 'It is typical of the human individual to act after having perceived the situation or after having thought about the situation perceived. Conscious activity is the antecedent of much human activity . . . destruction of the motor area leaves consciousness intact but eliminates the motor response.' Comparable notions are expressed by Köhler (19) and others (42, 43).

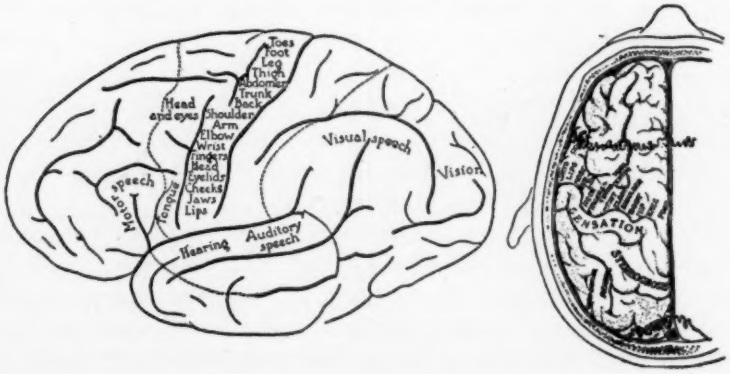
Aside from metaphysical dualism, such an account entails (a) the assumption of a dichotomy within the living brain between 'sensory' and 'motor' processes and (b) a concept of cerebral 'centers' considered to 'control' various physiologic functions. Our immediate task is to consider the grounds upon which these two notions stand.

(a) *The intracerebral dichotomy of 'sensory' and 'motor' events.* Troland (42), attempting to demonstrate the irrelevancy of the efferent arc to consciousness, assures his readers, 'the facts indicate that there is no direct correlation between the cortical motor control processes and the psychical field.' He supports this contention by the assertion that 'electrical stimulation of the motor cortex in a conscious subject produces movements of corresponding portions of the body, but no relevant sensory or perceptual consequences in consciousness.' Such a statement, however, is patently false-to-fact as may be verified by reference to the frequent experiences of neurosurgeons in electrically stimulating the so-called motor cortex of the unanesthetized human subject. Under such conditions the patient not infrequently reports sensory experiences of both somatic and visceral character. A comprehensive survey of the findings bearing

on this matter obtained in one representative neurological clinic has been prepared by Penfield and Erickson (33). Similarly, Dusser de Barenne and his collaborators (9), after years of critical research in strychnine neuronography of the 'sensory' and 'association' cortices, laminar coagulation of the 'motor' cortex, and comparable inquiries in the field of subhuman neurophysiology, felt impelled to reject the traditional distinctions and deal with the cerebral regions in question as the 'sensory-motor cortex.'

When we study the functioning animal (including our fellow humans) in the process of perceiving, just what is it that we observe and upon which we may agree in our reports? Obviously its manner of responding and nothing more. Without response—whether explicit or implicit or both does not greatly alter the matter for the purposes of the present discussion—we can say nothing about whether perceiving did or did not take place. The term 'perception' is clearly a substantive, derived from our observation of numerous specific *acts* of perceiving; the mere assignment of a label does not create a 'mental faculty' nor even a neural pattern. If we ask, as Revesz (38) did, whether a hen can perceive the difference in area between a smaller and a larger strip of cardboard upon which kernels of corn are scattered, we set up an experiment calculated to resolve the issue and we then watch her response. If she exhibits discriminative responses we agree that she has perceived; if not, we may only speculate about whether she has perceived. The same general procedure is employed when we attempt to decide whether a monkey can perceive a circular disc as such (*i.e.*, as distinguished from an ellipse, a square, a triangle, etc.). And in the course of our everyday contacts with our fellows, when from time to time we conclude 'he knows (or doesn't know) what it's all about,' the organism's responses constitute our criterion and our *only* criterion of its perceptual capacities, whatever intermediary devices, instruments of precision, etc., we may press into service to improve our observations.

(b) *The concept of cerebral centers.* Turning our attention to the brain itself, nowhere in the organ are we able to discover a separation of 'sensory' and 'motor' functions. All we can discover there is a complicated felt-work of cell bodies and their attenuations constituting a plenum of physical and chemical processes which we may with some success sample and which to a limited degree we are capable of altering experimentally. Whence, then, arises our notion as to the existence of sensory and motor 'centers' of the brain? Clearly from three sorts of empirical observations: (a) the alterations observed in the muscular and glandular behavior of an organism following destruction of a part of the cortex by disease or experiment; (b) similar alterations in behavior (verbal or non-verbal) observed upon stimulation of a circumscribed portion of the cortex; and (c) recordings of electrical signals obtained by picking up electrical potentials as they are propagated along neural pathways



Diagrams Which Show the Approximate Localizations of Various Functions in the Cerebral Cortex.

FIG. 8. A typical diagram from a currently used text (From L. Davis: *The Principles of Neurological Surgery*, 2nd ed., copyright, 1943, by Lea and Febiger, Philadelphia, and used with the permission of Dr. Davis). (7) The legend indicates that the 'sensory' and 'motor' *functions* referred to are localized approximately as labelled. From the general semantic viewpoint, such representation is both inaccurate and misleading. The regions are merely those portions of an extremely complicated and diffusely represented course of neural impulses involved in the exercise of a 'function' in which it is possible and convenient to modify the function by disease processes and by experimental technics.

connecting the periphery of the body—the integument, viscera, muscles and glands—with the cerebral cortex.

But the empirical findings derived from each of these sources may be interpreted with accuracy, with practical utility and with fewer unwarranted inferences and assumptions than are introduced in the traditional account. Instead of representing 'functions' as being localized in thus-and-such a cortical region (Fig. 8) (7), the account which seems to the writer preferable speaks of the region under consideration as one in which it happens (in the present state of physiologic science) to be both feasible and convenient for the investigator to influence or, as the case may be, to tap in on the function in question. In this way it avoids committing itself as to *what* intracerebral events correspond to 'sensation,' 'perception,' 'memory,' 'volition' and other mentalistic symbols and as to the *spatial limits* within which those events are confined. At the same time it rejects all 'either-orish' formulations which arbitrarily classify a function like vision as a 'sensory' process (thus disregarding the motor events inextricably involved in the acquisition of visual perception) and one like eupraxia—the ability to execute skilled acts—as a 'motor' process (thus disregarding the kinesthetic and cutaneous components involved in the acquisition and execution of the act).

THE GROWING data of electrophysiology recently acquired by the adaptation of radioelectronics to research in the neurological area do not appear to compel a retrenchment of the recommended view. Electric potentials can be detected with fair readiness along the neural pathways which extend from the receptors to those regions commonly called the 'sensory projection areas.' Beyond the latter regions, the course of the electric impulses becomes so diffuse and complex that it cannot be followed by methods now available. Quite obviously, however, this inability of ours can in no way provide us with a warrant for endowing the *last* area to which such potentials can be traced in the year 1949 with properties denied other way-stations in the spinal cord, medulla, mid-brain, basal ganglia, etc. We do not feel impelled to speak of any of the latter as 'sensory centers,' the activity of which subtends 'conscious experience,' even though we know full well that destructive lesions appropriately placed at such sites in the nervous system do indeed cut into 'conscious awareness' to a greater or smaller degree as, for instance, in the production of deafness by a tumor compromising the functional integrity of the roof of the mid-brain. Neither does it appear to follow from the mere observation that lesions located in the precentral ('motor') cortex often produce paralyses and that electrical stimulation of the same regions produces muscular contractions that the portions of the cortex thus affected *therefore* constitute the neuroanatomic basis of 'voluntary' or 'involuntary' movement. Similar paralyses and motor phenomena can be readily produced by stimulation of the projected pathways in the mid-brain, medulla, spinal cord and peripheral nerves. Yet these sites, though readily acknowledged as essential components of the total neural mechanism, are seldom spoken of, even by the most naive student, as 'centers' of 'voluntary' activity.

All in all, the traditional account appears to suffer from a familiar semantic difficulty: the equating of what is known concerning a particular *part* with *knowledge of the whole*. We are reminded of a remark long ago made by Hughlings Jackson to the effect that the identification of the locus of a lesion that produces a dysfunction is not equivalent to localizing the function. The generally-employed dichotomy well illustrates how easy it is to fall into the error of supposing that an arbitrarily made split in the verbal symbols corresponds to the existence of a split in the phenomena to which the words refer.

It is reasonable to suppose that there must have been some warrant for the development of the dichotomy of cerebral activity into 'sensory' and 'motor' events, 'centers,' etc., and in casting about in the history of neurology there is more than a casual suggestion that it received its first empirical support from, if it did not indeed originate in, experimental studies carried on by Walker (1809), Bell (1811) and Magendie (1822). The effect of these inquiries was to establish an anatomico-physiologic dichotomy of spinal nerves into (a) the dorsal roots, which under ordinary circumstances convey nerve impulses toward the spinal cord, and (b) ventral roots, which convey them away from the cord.

The experimenters thus demonstrated *afferent* and *efferent* functional processes; and had they confined their descriptions to these simple facts they might have laid down a neurophysiologic precept which would have kept later investigators of the physiology of the *central* nervous system from falling into errors such as those with which we have been dealing in the present communication. However, limited as they necessarily were by their own linguistic patterns, they used the terms 'sensory,' 'sensation' and 'motor' in connection with the spinal nerve roots. Following the demonstration in 1870 by Fritsch and Hitzig that electrical stimulation of the cerebral cortex in the neighborhood of the central fissure elicits movements of the limbs on the opposite side of the body, the 'voluntary motor center' appeared to have been demonstrated. By implication and later by empirical demonstration 'sensory centers' seemed to have been convincingly established. In point of fact, however, the cerebral organ does not exhibit anything of the sort; nor can its component nerve cells and their numerous processes be properly described in either-orish terms such as 'afferent' and 'efferent.'

To be accurately described and usefully employed for the furtherance of our comprehension of behavior, each intraspinal and intracerebral neurone must be considered as both 'afferent' *and* 'efferent': it is afferent with respect to thus-and-such a neurone and efferent with respect to yet another. Certainly no implication should be made incidental to such description that any one neurone (or even a circumscribed group of neurones), in contradistinction to its fellows, 'subtends' *sensation, perception, voluntary movement,* etc. Neither does it seem warranted to consider a series of several neurones, such as those between the retina and the 'visual' cortex, as 'afferent,' and those between the precentral gyrus and the anterior horn cells of the spinal cord as 'efferent.' Semantic dangers of an occult but none the less malignant nature inhere in such arbitrary practices.

VI

WE SHALL return in a subsequent article to a further examination of the concept of cerebral 'centers.' But incomplete as the present review has been, it should suffice to raise serious doubts as to the scientific utility of regarding perception as essentially a sensory process. Whether the problems relating to perception be approached from the gestalt or structuralistic points of vantage, it appears necessary for the scientist to deal with the involved phenomena as those of *perceptual response.* As we have seen, this conviction appears to be sustained by a dispassionate consideration of what present-day brain physiology, shorn of all adventitious principles that violate the 'law' of parsimony, has to offer us.

Throughout our review there has been strong intimation that the phenomena actually dealt with in 'perception' share much in common with those referred

to in the general semantic idiom as 'abstraction.' In both instances, the organism reacts to a part of a situation as if to the 'whole.' This selective manner of reacting appears to be determined by certain structural and functional features of the nervous system, and in bringing the present communication to a close we may briefly review these as they appear in three frames of reference: 1. the receptor and afferent neural mechanisms; 2. the central integrative mechanisms; and 3. the efferent and effector mechanisms.

1. *Determinants of selective response residing within the receptor and afferent neural mechanisms.* At least seven factors are identifiable under this heading: (a) the relative insulation of the nervous system in respect to the milieu of physical energies within which the organism functions; (b) the imperfections of the receptor apparatus and their accessory structures; (c) the transmutation of environmental energy-changes consequent upon the establishment and propagation of a relatively uniform type of neural energy along nerve pathways; (d) the nature of a stimulus; (e) the 'all-or-none' principle of neuronal activity; (f) the refractory period, and (g) the biologic process of adaptation.

Concerning the first three of these we shall have little to say at this point for the reason that they have already been referred to in our second communication (25). Obviously the circumstances related to them constitute potent initial factors in the selectivity which characterizes 'perceptual response' and, in a somewhat more generic sense, the process of abstraction.

The 'nature' of a stimulus similarly determines in considerable measure the selective character of the response process, for even in regard to those environmental energy-changes for which the organism does possess a receptor mechanism, the physical energy-changes to which it is sensitive must conform to certain specifications else they will not serve as a stimulus. Not every play of photons upon the retina acts as a stimulus to the visual apparatus, and by no means does every mechanical contact of an object against the skin surface stimulate the neural tactile apparatus. In fact, an energy-change in the environment must, if it is to excite the discharge of neural energies at all, surpass a certain minimal intensity and *change* through a certain minimal range of intensity *within a given time period.* Regardless of its intensity as measured in physical terms, an energy-change in the environment which is accomplished slowly and by small increments or decrements fails to arouse the centripetal discharge of a nerve impulse. This circumstance is confirmable by demonstration of the absence of tissue reactivity and by the absence or dearth of 'spikes' as observed electrophysiologically. It leads to a consideration of the familiar *all-or-none principle* of nerve activity: *if a nerve can be aroused to activity at all, it will discharge to the fullest extent of its capacity for the conditions existing at the time.* Irrespective of how much more energy than that necessary to trip off the neural discharge is brought to bear upon the receptor, the all-or-none prin-

ciple holds. After the discharge of the impulse, a certain brief period of time must elapse before sufficient 'recovery' takes place in the neuron to permit the tripping off of another discharge. The time required for such recovery is known as the *refractory period* and lasts for a few thousandths of a second. Both the all-or-none principle and the refractory period operate in such a way as to 'select' *fragments only* of the physical milieu to which the organism may respond. There is still another factor of far-reaching importance which determines selectivity as exhibited in the receptor and afferent mechanisms. This factor is called *adaptation.* A continuation of physical energy-changes such as are capable of evoking a neural response ultimately has the effect of producing a decrement of response until the latter finally disappears. This is confirmable by observing the behavior of the tissues under study and by electrical recordings. Thus, for a short time after the foot has been put into a shoe, the latter acts as a 'stimulus' and the observer reports he is 'aware' of it. In a few minutes, however, the wearer has become 'used to' the shoe, *i.e.,* the pressure-induced impulses have gradually fallen off and adaptation is said to have taken place. We cannot here enter upon a discussion of the theoretic and experimental aspects of adaptation. It may be said, however, that the process itself appears to be as fundamental a characteristic of living tissues (neural or otherwise) as irritability, conductivity, growth, reproduction and other well recognized properties of living matter. Whatever the details of the account of adaptation, its relation to perceptual response and 'adaptation' is patently clear.

2. *Determinants of selective response residing within the central integrative mechanisms of the brain and spinal cord.* The integrative factors within the central nervous system that bear upon selectivity of response are in essence those that relate to the transmission and shunting of impulses across the synapse. Anatomically, the synapse may be described as the intermeshing of the terminal arborizations of one neuron with the bushy dendrites and/or cell body of its neighbor(s). From the functional standpoint, the neural activity set up in one neurone is capable of influencing other neurones; that of the neurones constituting one segment of the spinal cord or brain stem is capable of influencing other segments; and that of the neurones constituting one suprasegmental structure *(e.g.,* the cerebellum) is capable of influencing other segmental *(e.g.,* the brain stem) and suprasegmental structures *(e.g.,* the cerebral hemispheres). The problems of neural integration are of course highly complex and their solution in the present state of our ignorance is exasperatingly elusive. Yet all that we have learned on the subject up to now indicates that they are essentially those of the *interaction of neurones upon one another across synaptic junctions.* Such studies as have been projected in various laboratories seem to point to one general conclusion, namely, that the excitable properties of neurones in the central nervous system are similar (except for minor differences in time relationships) to those of the peripheral nerves. 'It is unnecessary to assume,'

says Fulton (11), 'that any condition exists which differs essentially in basic nature from that found in the peripheral nerves.' Therefore our earlier remarks bearing upon the nature of a stimulus, the all-or-none principle, the refractory period and adaptation, as demonstrated in the activity of the receptor and afferent apparatus, are also applicable to the central integrative mechanisms. A neural impulse projected into a synaptic region does not 'jump the gap' and excite a new neuron unless the synaptic region has been rendered capable, in virtue of its just previous activities, of transmitting that impulse. All the involved neurophysiological discussions concerning *summation, extinction* and *inhibition* encountered in the literature on neural integration rotate about this broad principle. For obvious reasons it lies beyond the scope of this article to elaborate upon these complex neurophysiologic phenomena. It may be indicated, however, that what little is now known about them considerably illuminates the matter of the selective character of the organism's response to a 'total' presenting situation. For a comprehensive survey of the physiology of the synapse the interested reader is referred to the symposium prepared by Gasser, Erlanger, Bronk, Lorente de Nó and Forbes (12).

3. *Determinants of selective response residing within the efferent and effector mechanisms.* The already-familiar factors of stimulus, all-or-none activity, refractory period and adaptation are once again encountered when we turn to examine the functions of the *final common path* (FCP). The prototype of the FCP is the large pyramidal-shaped (motor) cell, the body of which is located in the anterior horns of the spinal cord and their brain-stem counterparts. In virtue of its activities, the *effectors* (muscles and glands) are made to exhibit a response—that is, to sustain or to alter an activity already in process. Upon each nerve cell of the FCP there converges a host of terminations of other nerve cells. As many as 1,000 such terminal 'boutons' have been identified. These converging terminations convey neural impulses which subserve various organic functions, some of which require for their exercise *excitation* and others *inhibition* of the FCP. But inasmuch as the all-or-none principle is operative in the FCP as elsewhere in the nervous system, it becomes apparent that the latter cannot simultaneously meet the demands brought to bear upon it by one function *and* those brought by a rival function. There exists, therefore, a competition not unlike a tug-of-war for 'control' of the FCP, the outcome of which at any given moment in the continuing game is presumed to be determined by several considerations: (a) the 'nature' of the function of reflexes being subserved; (b) the relative intensity of the stimuli; and (c) the duration of action of the reflexes involved in the exercise of the function. These will now be briefly illustrated.

(a) The factor relative to the 'nature' of the function of the reflex is best illustrated by the demonstration that some reflexes are *prepotent* over others. Thus, for example, a flexion ('withdrawal') reflex, thrown into action by the

impingement of a nocuous agent upon the skin is said to be prepotent over an extensor reflex subserving the maintenance of a posture for the reason that the former commonly gains control of the FCP in competition with the latter. Among the reflexes that subserve the various somatic and visceral functions of the organism there exists a sort of 'pecking order,' such that certain of them gain ascendency with fair regularity over others and yet in their own turn are dominated by still others. In general, the nociceptive reflexes hold a place at or near the top of the 'pecking order.'

(b) The 'relative intensity' factor (including the frequency and persistence with which the FCP is bombarded) goes far in determining which of several rival impulses will gain the ascendency at a given moment. Thus, a posture-maintaining function at present usurping the FCP may be 'displaced' (for a time) in favor of a scratch reflex evoked by a small insect crawling across the animal's cutaneous surface. Of the various functions mediated over the FCP, some are 'allied' to one another and others are 'antagonistic.' The intensity-factor of which we are now speaking is therefore expressed in part by the extent to which reflexes allied to one another voice their demands for the FCP over those of an antagonistic character.

(c) The factor of 'duration of action' of a reflex often operates to facilitate its displacement by a competitor. This is one of the numerous circumstances loosely spoken of as 'fatigue.' If, for example, a scratch reflex has been operative for some time it may be more easily diverted by the application of a relatively mild nocuous stimulus than by a stronger nocuous stimulus applied soon after the inception of the scratching. Once again the response proves to be a matter of selectivity.

All these physiologic considerations have been well epitomized by Fulton in his observation that 'reflex integration involves the appropriate adjustment of allied and antagonistic reflexes.'

SUCH EVIDENCE as has been reviewed up to now appears to point up the selective character of the organism's responses and to suggest the pattern for a formulation concerning both perceptual response and abstraction, namely, that any reaction, whether adaptive or non-adaptive, must be to a *part* rather than to the 'whole' of a presenting situation. In view of the characteristics of the nervous system (as we comprehend them in the year 1948), the necessity of framing our account of perception and abstraction in these terms would appear to be almost inescapable. The older 'sensory' and 'mentalistic' accounts appear incapable of serving the purposes of scientific inquiry. And inasmuch as the process of perception is unavoidably involved in any attempt to describe what is meant by the terms 'reality' and 'unreality,' we are led back by easy steps to the formulation proposed in our previous communication on the sub-

ject: *we take to be 'real' that to which we have developed relatively adaptive behavioral patterns of response.*

Quite necessarily there must remain for the reader many gaps in the account of perception and abstraction recommended in the present article. Some of these are incapable of being filled in the present state of our knowledge; others, however, can be reasonably filled by an examination of the *proprioceptive mechanisms* (kinesthesis) of the nervous system. To this task we shall turn in our next communication.[4]

References

1. E. D. Adrian, *The Physical Background of Perception* (London 1947) 95 pages.
2. E. D. Adrian, *op. cit.*, 70-75.
3. J. M. Baldwin, *Dictionary of Philosophy and Psychology* (vol. 1, New York 1902) 515.
4. J. M. Baldwin, *op. cit.*, 276-79.
5. A. Binet, *The Psychology of Reasoning* (ed. 3, transl. by A. G. White, Chicago 1912) 4-8.
6. J. F. Dashiell, *Fundamentals of Objective Psychology* (New York 1928) 389, 424.
7. L. Davis, *The Principles of Neurological Surgery* (ed. 2, Philadelphia 1943) 42.
8. J. G. Dusser de Barenne, 'Experimental Researches on Sensory Localisations in the Cerebral Cortex.' *Quarterly Journal of Experimental Physiology,* 9.355 (1916); 'Sensori-motor Cortex and Thalamus Opticus,' *American Journal of Physiology,* 119.265 (1937); *idem* with H. W. Garol and W. S. McCulloch, 'Functional Organization of Sensory and Adjacent Cortex of the Monkey,' *Journal of Neurophysiology,* 4.324 (1941); *idem* and W. S. McCulloch, 'Functional Organization in the Sensory Cortex of the Monkey *(Macaca Mulatta),*' *Journal of Neurophysiology,* 1.69 (1938).
9. J. G. Dusser de Barenne, H. W. Garol and W. S. McCulloch, 'The "Motor" Cortex of the Chimpanzee,' *Journal of Neurophysiology* 4.287 (1941); J. G. Dusser de Barenne and W. S. McCulloch, 'Functional Boundaries in the Sensori-motor Cortex of the Monkey.' *Proceedings of the Society for Experimental Biology and Medicine in New York,* 35.329 (1936). J. G. Dusser de Barenne and H. M. Zimmerman, 'Changes in the Cerebral Cortex Produced by Thermocoagulation,' *Archives of Neurology and Psychiatry,* 33.123 (1935).
10. F. N. Freeman, *The Psychology of the Common Branches* (New York 1933) 51.
11. J. F. Fulton, *The Physiology of the Nervous System* (ed. 2, revised, London 1944) 66-79.
12. H. S. Gasser, J. Erlanger, D. W. Bronk, R. Lorente de Nó and A. Forbes, *Symposium on the Synapse* (Springfield, Ill. 1939) 361 ff.
13. A. I. Gates, *Elementary Psychology* (New York 1926) 99.
14. H. Head, *Studies in Neurology* (vol. 2, London 1920) 832.
15. W. S. Hunter, *General Psychology* (Chicago 1919) 217.
16. T. H. Huxley, *Collected Essays, Hume, with Helps to the Study of Berkeley,* (New York 1894) 73.
17. K. Koffka, *The Growth of the Mind* (New York 1928) 426 pages.

[4] The writer desires to express his warm appreciation of the generosity of Drs. James Papez, A. T. Rasmussen and Loyal Davis in allowing him to reproduce illustrations from their publications.

18. W. Köhler, *Gestalt Psychology* (New York 1929) 158, 171, 174-77.
19. W. Köhler, *op. cit.*, 179 ff.
20. J. Knott, R. Hayne and R. Meyers, 'A Contribution to the Physiology of Sleep: Wave Characteristics of Human Electrograms Simultaneously Recorded from the Thalamus, Corpus Striatum and Scalp Surface,' Chicago Neurological Society, Dec. 14, 1948 (Abstract to appear in *Archives of Neurology and Psychiatry).*
21. G. T. Ladd and R. S. Woodworth, *The Elements of Physiological Psychology* (New York 1911) 382-3.
22. G. H. Lewes, 'What is Sensation?' *Mind* 1.157 (1876); 'Consciousness and Unconsciousness,' *Mind* 2.156 (1877).
23. W. K. Livingston, *Pain Mechanisms: A Physiologic Interpretation of Causalgia and Its Related States* (New York 1943) 73 ff.
24. R. Meyers, 'The Nervous System and General Semantics: I. The Aims of General Semantics and the Method of Science,' *ETC.* 5.231 (1948).
25. R. Meyers, 'The Nervous System and General Semantics: II. "Reality" and "Unreality",' *ETC.* 6.27 (1948).
26. D. T. V. Moore, *Dynamic Psychology* (ed. 2, Philadelphia 1926) 45-6.
27. G. Murphy, *A Briefer General Psychology* (New York 1935) 3, 4.
28. J. W. Papez, *Comparative Neurology* (New York 1927) 356-7.
29. J. W. Papez, *Human Growth and Development* (Ithaca 1948) 101-104, 129-37.
30. J. W. Papez, 'Structures and Mechanisms Underlying the Cerebral Functions,' *American Journal of Psychology* 57.291 (1944).
31. J. W. Papez, 'The Brain and Cerebral Functions,' *Cornell Era,* pp. 6, 7, 24, 30 (Jan. 1946).
32. Karl Pearson, *The Grammar of Science* (New York 1892) 52-3.
33. W. Penfield and T. C. Erickson, *Epilepsy and Cerebral Localization* (Springfield, Ill. 1941) 39-46.
34. F. A. C. Perrin and D. B. Klein, *Psychology: Its Methods and Principles* (New York 1926) 287 ff.
35. W. B. Pillsbury, *The Fundamentals of Psychology* (revised, New York 1923) 294-5.
36. R. Pintner, J. J. Ryan, A. A. Aleck, P. V. West, L. D. Crow and S. Smith, *An Outline of Educational Psychology* (New York 1947) 52-3.
37. A. T. Rasmussen, *The Principal Nervous Pathways* (ed. 2, New York 1941) 14.
38. G. Révész, 'Experiments on Animal Space Perception,' *British Journal of Psychology* 14.387 (1924).
39. E. B. Titchener, *Experimental Psychology* (New York 1922) 127-130.
40. E. B. Titchener, *Primer of Psychology* (New York 1905) 95.
41. L. T. Troland, *The Principles of Psychophysiology. The Problems of Psychology and Perception* (vol. 1, New York 1929) 215.
42. L. T. Troland, *op. cit.*, 181.
43. H. C. Warren, *A History of the Association Psychology* (New York 1921) 295.
44. H. C. Warren, *Elements of Human Psychology* (New York 1922) 143 ff.
45. J. Watson, *The Philosophy of Kant as Contained in Extracts from His Own Writings* (New York 1891) 22.
46. L. Witmer, *Analytical Psychology* (Boston 1902) 1-6.
47. R. S. Woodworth, *Psychology* (ed. 4, New York 1940) 454.
48. W. Wundt, *Lectures on Human and Animal Psychology* (transl. by J. E. Creighton and E. B. Titchener, London 1894) 244-5.
49. W. Wundt, *Physiologische Psychologie* (ed. 5, Leipzig 1903) 384.

ANTI-SEMITISM:
*A Study in Mistaken Map-Territory Relationships**

S. I. HAYAKAWA

MOST WORDS in everyday discussion and controversy that are laden with affective connotations are incredibly complex both in the feelings they express and the reactions they arouse. In order to understand, even partially, some of the complexities involved, let us look into the word 'Jew,' exploring some of the socio-economic bypaths into which it will lead us. Such an exploration will serve to illustrate how much more we need to know than dictionaries can tell us before we begin to know what is behind some of the words we use.

'One Born Every Minute'

WHENEVER people of a pre-money culture (farmers, fishermen, and other rural folk who live on what they produce, swap the surplus, and rarely handle money) come into contact with people skilled in money and credit transactions (those who understand bookkeeping, interest, mortgages, notes, banking, and such matters), the latter are likely to take advantage of the former. The former are *handlers of economic things* (potatoes, fish, coconuts, etc.), and the latter are *handlers of economic symbols* (notes, bills, futures, etc., covering the exchange of potatoes, fish, coconuts, etc.). The thing-handlers, even if they have not been taken advantage of, are likely to feel suspicious and uneasy in dealings with the symbol-handlers. They are not skilled in computing interest; many have difficulty with simple addition and subtraction; the words in the fine print of sales agreements and contracts are over their heads. Hence, the thing-handlers usually attribute their financial disappointments to the 'unscrupulousness' and 'cunning' of the shopkeepers, money-lenders, and traders.

The experiences of many Polynesian and Asiatic people with skilled Chinese merchants, of rural Japanese with city slickers from Tokyo and Osaka, of rural Mediterranean folk with Syrian traders, of rural Americans with the 'Connecticut Yankee' (who sold, it will be remembered, 'wooden nutmegs' to unsuspecting yokels), of farmers everywhere with bankers, and of rural Americans and Europeans with Jewish tradesmen and money-lenders, have been very much alike. Those who couldn't understand figures have resented (often with good reason) the clever city people who could. The words 'Chinese merchant,' 'Osaka merchant,' 'Syrian,' 'Connecticut Yankee,' 'money-lender,' 'banker,' and

* From the author's forthcoming book, *Language, Thought, and Action.*

'Jew' have therefore had almost identical connotations at various times and in various parts of the world. All these words (and there are many more like them depending on what part of the world you are in) represent, for back-country people, the semi-literate or illiterate man's resentment of the verbally facile urban trader, his baffling percentages and papers, and his whole mysterious system of economic symbols. The farmer who can never figure out the why's and wherefore's of all the deductions that make his milk-checks smaller from month to month, the miner who is mystified by the fact that the longer he works the more money he seems to owe to the company store, the Polynesian native who puts a cross on a piece of paper only to find that he has virtually sold himself into slavery on a plantation—all such victims of ignorance have reason to hate the symbol-handler. To many illiterate Christian folk, therefore, the 'Jew' is the classic symbol of the hated economic symbol-handler, and they use the word to express their resentment of symbol-handlers whether the particular symbol-handlers they resent happen to be Jews or not.[1]

There is no mystery about the fact that many Jews have gone into symbol-handling occupations. Since as long ago as the Middle Ages, Christian prohibitions against Jewish ownership of land has prevented them from developing as farmers. (However, Jews in Palestine today are proving to be excellent agriculturalists.) The exclusion of Jews from membership in craft-guilds kept them out of most organized skilled trades. Moreover, a Jew never knew when a pogrom might start, which meant that he would have to fly for his life, leaving everything behind except his shirt and starting over again in a strange town. Skill in trading—that is, the ability to handle economic symbols—like the equipment necessary for tailoring or watch-making (also traditional Jewish occupations)—is something you can take with you when you have to flee. The development of symbol-handling ('middleman') skills was one of the very few economic courses open to Jews.

For these reasons, there was some justification, long, long ago, for using the figure of the 'Jew' as a symbol of the economic symbol-handler. Today, however, in a society such as ours almost completely dominated by economic symbol-handlers and their subordinates (that is, the entire white-collar class, from corporation presidents down, whose days are devoted almost entirely to

[1] Even among literate Christians who regard themselves as too intelligent to share the prejudices of the illiterate, an attenuated form of this identification of Jews as symbol-handlers persists to a remarkable degree. Jews, the writer was told by a faculty-wife at a tea in a university community recently, are extraordinarily adept at handling words and figures and ideas, but they are not skillful in any work requiring manual dexterity. On another occasion the writer learned from a shoe-clerk in a large Jewish-owned department store, first, that his employers were very kind and good to him, and secondly, that Jews were very clever and wonderful people who, having great brains for figures, were much too smart to do any manual work themselves. (Just as he was saying this, an obviously Jewish stock-clerk staggered by under a huge load of shoe-boxes.)

paper-work), it is ridiculous to select Jews as being peculiarly representative of the symbol-handling occupations.

Marginal Business Men

BUT WELL-EDUCATED urban people who are symbol-handlers themselves also have prejudices against Jews. They often contend, and demonstrate with some evidence, that not all, but a significant number, of Jews in business have characteristic ways of behaving that they find disagreeable. They feel justified, therefore, in approaching Jews with at least a minimum of cautious reservation.

But the 'Jewish' characteristics they describe are not at all peculiar to Jews. What they usually describe are the characteristics of *marginal business men.* The marginal business man is one who does not belong in the *established* profitable business of a community. In the United States, he is often a fairly recent immigrant or a member of a minority group. (Members of the majority don't have to go into marginal businesses; they can usually find employment in established enterprises.) Starting as a rule with little capital or none, marginal business men go into neighborhoods that are too unpromising or into enterprises that have too uncertain a future for larger, established companies to be bothered with. Chili parlors, small restaurants (Italian, Chinese, Greek), Jewish dry-goods stores and delicatessens, shoe-repairing shops, second-hand and junk businesses of all kinds, and almost all services for the Negro trade, are the commonest examples of marginal business at the present time. Many unscheduled airlines are also marginal businesses in the same sense.

Jewish business men in the United States (and in many other nations, for discrimination against and persecution of the Jews is common throughout Christendom) are largely either in marginal enterprises or in enterprises that were marginal until relatively recently. The predominance of Jews in the ready-to-wear garment industry is due to the fact that they got into it at a time when most people made their own clothes. They also got started in the moving picture business at a time when it was so marginal that few people ever imagined that it would ever emerge from the penny arcade. Success in marginal business requires one or more of the following: (1) finding an undeveloped market that established businesses have ignored or overlooked; (2) having the foresight (or luck) to get into a kind of business that is not profitable now, but eventually will be; (3) being sufficiently aggressive, skillful, and shrewd in business to survive even under the most unfavorable conditions; (4) being willing to work twice as hard as the next man.

Trying to achieve success in marginal business, then, imposes similar disciplines on all people who go into it, regardless of color or creed. And similar disciplines produce similar character traits. At the present time, many Negroes

in Chicago have become, and many more are becoming, successful business men, starting in marginal enterprises. Among the more recent successful Negro enterprises are insurance (white firms have for a long time turned down Negro customers) and publishing (white magazines have rarely taken into consideration the interests and wants of the Negro reader). Many more successful Negro businesses will no doubt follow. What is interesting is that many Negro business men who have submitted to the disciplines of marginal business show most of the characteristics popularly attributed to Jews: for example, (1) a singleminded absorption with making money, preferably the quickest way; (2) extreme aggressiveness and shrewdness, and an unwillingness to pay high wages; (3) a tendency to be somewhat overproud of the money they have made; (4) a tendency to adhere firmly to the principle that 'business is business'—in other words, a willingness to sacrifice considerations of sentiment or humanitarianism or even ethics if necessary in the interests of business survival. (The owner of a marginal, non-network radio station—he was neither a Jew nor a Negro—once said to the writer in justifying his broadcasting of some questionable advertising, 'When we are big and rich, we'll be able to afford to be ethical.')

Indeed, America's reputation throughout the nineteenth century as a 'money-mad,' 'uncultivated,' and 'materialistic' society rests largely on the fact that America was very much a 'land of opportunity.' In other words, it was a place where the marginal business man had before him many chances of success, with newly found natural resources, new inventions, and large, promising marginal areas (such as the frontier) to exploit, offering everyone a constant hope of quick riches. The discipline of the marginal business man (rather than that, say, of the corporation official) was the standard training of the nineteenth century American business man, who believed emphatically in the 'business is business' principle, who believed in being 'wide awake,' and who believed in going into business for himself and 'wearing no man's collar.' Most of the traits that contemporary upper-class Americans find objectionable in Jews are traits that were held up for admiration and emulation throughout the nineteenth century by the entire American business community.

The success of a marginal business man is almost always greeted with mixed feelings. He may have become rich, but he has usually had to work too hard to have had time to acquire the polish and the social mannerisms of those who have had their money longer. If he was an immigrant, he may still speak with a foreign accent; if he rose from the lower class, he may still retain lower class manners or tastes; if he started as a lower class immigrant, (as many successful American marginal business men have), he enters the society of the wealthy and cultured with two strikes against him. As he climbs the socio-economic ladder, he is subject to the contempt of the aristocrat for the *parvenu* —even if the aristocrat (as is usually the case in Chicago) is himself only one

generation removed from marginal business, his grandpappy being a Swede who ran up a small carpentry shop into a big furniture factory.

The attitudes of the upper class are reflected and often intensified in the lower and middle classes of the majority group. The latter especially tend to feel that the marginal business man, by working so very hard, uses unfair tactics. The impressive industriousness of Jewish shopkeepers and of Japanese market-gardeners in California has always aroused resentment on the part of those who prefer to stop working after an eight-hour day. The marginal business man is also resented for being 'clever.' What is not sufficiently appreciated is that he has to use his head in order to be able to survive at all.

Today, many Negro children are being told, as Jewish children have been told for generations, 'You have to be twice as smart and work twice as hard as the next man in order to get half as far.' Consequently, many more Negro business men in the next few decades are going to prove (as some have already) to be both extremely resourceful and extremely hardworking. But both their resourcefulness and their hard work will largely be unnoticed by white people, since so many of them 'know' that Negroes are stupid and lazy.

The disadvantage of calling the characteristics of marginal business men 'Jewish characteristics' lies not only in the errors we may make in evaluating individual Jews. An even graver disadvantage is the resulting *misdirection of attention*. The word 'Jewish' draws attention away from the observation of the effects of economic and social pressures as they affect *all* people. The belief in special 'Jewish' characteristics is an enormous obstacle to the understanding of human nature and society.

Negro Anti-Semitism

THE PREJUDICE on the part of Negroes against Jews represents the ultimate confusion resulting from such socio-economic facts as have been mentioned. In New York, Detroit, and Chicago, many shops in Negro neighborhoods are owned by Jews, Negro neighborhoods being marginal business areas and Jews being marginal business men. A considerable proportion of Negroes in large Northern cities are backcountry folk, recently arrived from the rural regions of the South. Like rural immigrants from Lithuania, Poland, Germany, or Mexico, Negro country folk are capable of being victimized by small-loan sharks, sellers of gaudy and short-lived 'de luxe living and dining room suites,' and merchants who offer you a $39.95 watch for one dollar down and a dollar a week for the next fifteen years. Hence the resentment of the helpless 'thing-handler' for the shrewd 'symbol-handler' is combined with the resentment that any customer must feel for the practices of some marginal business men. This combined resentment is channeled, as the result of the Christian traditions to which Negroes are heir, against 'the Jews.'

(A Chicago Negro who came from the South during World War II was

complaining of the prices charged by an Italian marginal grocer. 'The damn Jew,' he said. 'But,' his friends said to him, 'Serrano isn't a Jew; he's Italian.' 'I don't care what he is,' he answered. 'He's still a Jew to me.')

Fortunately, many Jewish business men in the Negro communities understand the situation. Many have established cordial relationships and a reputation for fair dealing with customers. They have often united to bring pressure to bear on unethical business men in order to change their practices. Many Jewish business men are in the forefront of the demand for improved economic opportunities for Negroes and have set the example themselves not only by hiring Negro help, but also by training Negroes and placing them in positions of high executive responsibilty. However, prejudice being as irrational as it is, and marginal business being as exacting as it is, the habit of 'blaming the Jews' will not quickly die out of the Negro community. As Negro business men gradually take over the business in the Negro community, however, the consumer will discover (as some of them are already discovering) that some Negro marginal business men will display the same extremes of aggressive and unscrupulous business conduct that some marginal Jews have displayed. In such a case, exploited Negroes will probably develop a prejudice against all Negro business men—which will not be a very much more intelligent reaction, but it will at least take some of the heat off the Jews.

Maps versus Territories

FROM THE point of view of the ideology of the business community, the fact that marginal business men need not remain marginal forever is *the* great fact about America. According to the most conservative spokesmen of American business, America is a great country *because* a newsboy may some day become the president of a large corporation, *because* a man may start with a peddler's cart and wind up with a big chain of department stores. Such successes are a large part of what most of us mean when we say 'equality of opportunity' and the 'free enterprise system.' Moreover, the fact that liberals and conservatives alike—and even many socialists—promise vehemently to help the 'small business man' attests to the universality in America of the belief that the door must never be closed to marginal business. Meanwhile, however, the leaders of some labor unions—especially some craft unions—under cover of pious talk about helping 'the working man and the small business man,' make it impossible for many a marginal enterprise to operate; and associations of powerful (non-marginal) business interests, also under cover of stirring verbalizations about the 'little business man,' often send lobbyists to Washington and to state capitals to help big businesses get even bigger.

These mixed attitudes towards the marginal business man which show themselves both in our social life and in business appear to rest ultimately on a mixed attitude towards free enterprise itself. How free should free enterprise

be? Some business men mean by 'free enterprise,' 'free and open competition and let the best man win.' Others mean 'free to enter into agreements *not to compete.*' Still others use either meaning of the word 'free' (and several other meanings besides) without ever noticing the extent to which it covers, in their thinking, entirely contradictory notions. The same man who talks with pride of the achievements of the 'competitive system' often supports 'fair trade' agreements (which are agreements not to compete) and grows furious about the 'chiselers' who actually compete by the handiest and most obvious device that business offers, namely, price-cutting.

But the business man is by no means alone in his inconsistency. In the conflict of motives and interests in which we are all involved in our economic and social life in a highly restless society, maintaining orderly relationships between verbal 'maps' and nonverbal 'territories' is an extremely difficult—perhaps for many people a hopeless—task. Of course we want everyone to have a chance to be rich—but the colored Mr. Jones is getting rich and I am not, so damn Jones for not knowing his place! Of course we want the little business man to have the chance to become a big business man—but we hate 'Big Business'! Of course, we want a free competitive system—but we don't like the way some people compete *(i.e.,* successfully)! Of course, we believe in the dignity of labor—but what *could* that woman have been thinking of, inviting that truck-driver's wife to our A.A.U.W. meeting? Of course, we believe in equality and I am certainly as good as anybody else—but the *nerve* of those shanty Irish thinking they're as good as me! Of course, we must show the rest of the world that we are a peace-loving nation—but we must have the greatest air force in the world in addition to the atomic bomb! Of course we believe in the brotherhood of man—who the hell says we don't?

Inconsistencies of thought and feeling are perhaps inevitable in human affairs. Our higher level abstractions are, even in the best of us, slightly out of kilter with our lower level abstractions. But both meaningful utterance *and personal and social integrations* depend upon the existence of *orderly* relationships between our higher and lower level abstractions.[2] This is a thought that should, if properly absorbed, keep the reader quiet for at least a week. It has kept the writer quiet, on a number of topics, for even longer periods.

[2] See especially A. Korzybski, *Science and Sanity* (1933) and W. Johnson, *People in Quandaries* (1946). What H. Winthrop refers to as 'telic disintegration' is probably also related to such inconsistencies as are here discussed; see his 'Logos, Telos, and Psyche,' *ETC.,* 5.252-262 (Summer 1948).

☆ NEWS AND MISCELLANY ☆

Third Congress on General Semantics

The Third Congress on General Semantics will be held at the University of Denver, Denver, Colorado on July 22, 23, 24, 1949. The following are members of the Committee on Organization: DR. ELWOOD MURRAY, Director, School of Speech, University of Denver; JOHN L. JACOBS, President, Baur's Stores, Denver; M. KENDIG, Educational Director, Institute of General Semantics, Lakeville, Connecticut.

DR. DOUGLAS M. KELLEY, Wake Forest College, The Bowman Gray School of Medicine, Winston-Salem, North Carolina, is Chairman of the Program Committee. Communications about the program should be sent to Dr. Kelley. Those wishing to attend the Congress may obtain preliminary programs and registration forms from Dr. Murray.

Chicago Chapter Presents Lecture Series

The annual Chicago public lecture series on general semantics, organized this year by the Chicago Chapter, began February 25 at Thorne Hall, on the Chicago campus of Northwestern University. CAPTAIN J. A. SAUNDERS, U.S.N., Ret., and former Liaison Officer with the Senate Committee on Naval Affairs, opened the series with his lecture, 'General Semantics: A Science to Make Use of Science,' illustrated with slides.

DR. RAYMOND MCNEALY, surgeon and hospital administrator, gave the second lecture, 'Doctors, Patients and General Semantics,' on March 11. Other lectures presented in the series were: DR. FRANCIS P. CHISHOLM. 'Foundations of Future Mental Health,' March 25; DR. S. I. HAYAKAWA and DR. ELIAS H. PORTER, Communication: The Basic Process in Nondirective Therapy and General Semantics,' April 1 (Dr. Porter is Research Associate in Psychology at the University of Chicago); DR. ANATOL RAPOPORT and DR. BARROWS DUNHAM, 'Are Semanticists Idealists?' April 8 (Dr. Dunham is head of the Philosophy Department at Temple University and author of *Man Against Myth*).

Chairman of the series was HERMAN BARNETT. Other committee members were IRA JONES, GEORGE A. TAYLOR, MR. and MRS. ALBERT E. MCKEE, MR. and MRS. GILES B. WEISE, MRS. SAUL D. TANNENBAUM, GORDON ABBEY, J. J. RYAN, MRS. E. JANDA, and MRS. HENRY IRWIN. Average attendance was 650 at each lecture.

S. I. Hayakawa gives a six-lecture advanced course in general semantics at Roosevelt College, Chicago, May 9, 10, 18, 19, 23 and 24.

Miscellany

DR. FRANCIS P. CHISHOLM gave a five-session seminar at Tulane University, New Orleans, La., March 4, 5 and 6. . . . SURINDAR SURI continues to give his courses called 'Semantics' and 'Advanced Semantics' at the Lawson YMCA in Chicago. . . . The courses in general semantics offered by CAPTAIN J. A. SAUNDERS in the Graduate School of U. S. Department of Agriculture also continue to be given. . . . DR. IRVING J. LEE lectured on general semantics at Dartmouth College, Hanover, N. H. on March 15. . . . From March 17 to March 21, DR. S. I. HAYAKAWA lectured to the student body of Southwest Texas State Teachers College at San Marcos, students of the University of Texas at Austin, a meeting of the Texas Conference of Teachers of English at San Antonio, and a student-faculty group at Southern Methodist University in Dallas. Following Dr. Hayakawa's visit, a meeting was held to organize the Dallas Chapter of the International Society. Persons interested in Chapter activities may get in touch with MRS. J. B. MCGRATH, 3918 Hanover, Dallas 5. . . . DR. JOHN KESSLER gave, at the Downtown YMCA in St. Louis, Mo., a nine-week evening course on 'How Words Affect Human Behavior,' an introduction to general semantics. The course was divided into two sections, beginning January 10 and 11 respectively.

General Semantics in Pueblo, Colorado

A seminar in general semantics was given at Pueblo Junior College, Pueblo, Colorado, jointly by REV. ROBERT LEE DUTTON, DR. STEPHEN E. KRAMER (psychiatrist), and FRITZ AGATE (research worker in anatomy), in the spring of 1948. DR. ELWOOD MURRAY of the University of Denver was among the guest lecturers. Some sixty persons enrolled for the course.

The nucleus of the seminar was provided by a study group from the First Congregational Church of Pueblo, of which Rev. Mr. Dutton is pastor. The group suspended its own meetings in favor of the seminar. During the fall of 1948, the study group reassembled with larger membership, many of the new members having been brought in as a result of the seminar. The church study group was divided into three sections, each applying the principles of general semantics to a different area: (1) Bible study; (2) personality reconstruction; (3) public affairs. Some fifteen persons were enrolled in each.

Summer Seminar-Workshop

The Institute of General Semantics announces the sixth annual Seminar-Workshop in General Semantics to be held at Lakeville, Conn. August 14 to September 6, 1949. The course will consist of forty hours of training lectures by ALFRED KORZYBSKI and sixty hours of workshop sessions conducted by

M. KENDIG and DOUGLAS M. KELLEY, M.D. Detailed information may be obtained from M. Kendig, Institute of General Semantics, Lakeville, Conn.

Pasadena Chapter Activities

On January 22 the Pasadena Chapter sponsored a lecture for the general public by DOUGLAS GORDON CAMPBELL, M.D. for the benefit of the International Society treasury. Dr. Campbell, assistant clinical professor of psychiatry and lecturer in social welfare at the University of California, spoke on 'General Semantics and Community Mental Health.' The lecture was well attended, and the resulting proceeds were sent to the Society.

Other speakers during the past year who have addressed Pasadena Chapter meetings have been: DR. BERTRAND S. FROHMAN, author of *Brief Psychotherapy;* J. RUSSELL BRUFF on 'General Semantics in Science Teaching'; DR. JOHN D. MCRIARTY, psychiatrist, 'Identification and Misevaluation'; A. E. VAN VOGT, 'Dynamic General Semantics'; A. W. PEARSON, M.D.; DR. DAVID H. FINK, psychiatrist, 'Psychiatry from the Point of View of General Semantics.' The Chapter also had a recording of a lecture by Alfred Korzybski for a November meeting and one of Dr. Jules Masserman's cat films, 'Dynamics of Experimental Neurosis' for a January meeting.

General Semantics for Students of Theology

During the spring and summer quarters of 1948, two series of seminars in general semantics were conducted at the Manteno (Illinois) State Hospital, for students in clinical training in theology. The students, under the guidance of the Council for Clinical Training in Theology, receive their practical experience in institutional work in blocks of three months each.

Two groups of five and seven students each engaged in the sessions which were open to and attracted personnel from other disciplines as well. Each seminar consisted of five or six sessions at weekly intervals and each of these was composed of a two-hour presentation of the substance of general semantics by DR. ALFRED PAUL BAY, Superintendent of the Hospital, followed by a hour discussion of the material by the group.

The students were given an opportunity, in the course of their pastoral work during the week, of discovering errors in evaluation on the part of the institutional patients. Some students were successful in correcting these misevaluations as they encountered them, with resulting symptomatic improvement in the patients. These incidents furnished material for discussion at subsequent meetings of the groups.

News of the New York Chapter

An intensive advanced short seminar entitled 'General Semantics: Applications of the Method,' was given by S. I. HAYAKAWA at the Katherine Dunham

School of Cultural Arts, 220 W. 43rd St., April 13 to 21 under the sponsorship of the New York Chapter of the International Society for General Semantics. HARRY HOLTZMAN was in charge of arrangements. The Chapter also sponsored a series of five lectures at Cooper Union, on Monday evenings, March 28 to April 25. Lecturers were ALFRED KORZYBSKI, LILLIAN R. LIEBER, HUGH GRAY LIEBER, S. I. Hayakawa, and MARTIN JAMES.

News from Los Angeles

New public high school courses in general semantics were offered this spring by the following high schools in Los Angeles: Fairfax High School (ROBERT L. READ, Instructor); Inglewood High School (PENELOPE PEARL); Los Angeles High School (PEYTON CALLAWAY); North Hollywood High School (W. R. BOORMAN); Roosevelt High School (WALTER MILLAR); University High School (PEYTON CALLAWAY).

Eight general semantics home study groups were sponsored by the Los Angeles Chapter this spring. Among those offering their homes for this purpose were: RAYMOND BOOTHE, MAURICE BELZER, JOHN DERRICO, RUTH GRIFFITH, RUTH LLOYD, BEATRICE JONES.

✡ CORRESPONDENCE ✡

How About 'Evaluatics's

SIRS: In getting started in general semantics, I found myself seriously misevaluating the discipline. At first depending solely on the printed word, I progressed but slowly. Gradually I came to understand that I was unconsciously permitting my older evaluation patterns of 'the meaning in the word,' etc., to block my efforts to develop the new pattern in which the emphasis is placed upon the individual *evaluating* the symbol. And it became apparent to me that writers on general semantics were often encountering the same difficulty and fostering it by what they wrote. Thus 'language' was observed to be linked with 'action,' implying that language may function as an operationally effective agent influencing the passive object, the individual.

To free myself from this frequent unconscious reversion to the former orientation toward human behavior in sign-symbol situations as the outcome resulting from the effective operation of sign and/or symbols *upon* the individual, and to maintain more constantly the orientation toward human behavior as primarily an evaluation process occurring *in* an individual, I have found it helpful to avoid the use of certain terms. The words avoided were those which, because of past and present usage, I seemed persistently to associate with the older evaluation patterns.

Among these terms were the words *meaning* (as applied to symbols), *signification,* and, most important of all, *semantics.* The use of these words seemed too often to be associated with a misorientation and a misevaluation when judged in terms of the basic formulations of *general semantics.* Whenever I used these terms I seemed to be implying that in a situation involving a 'human individual in a sign-symbol field' the effective operator causing action was located *outside* the individual *in* the signs and/or symbols.

I finally considered the advisability of discarding the label 'general semantics.' Because much of my own difficulty in getting at the essential features of this discipline seemed traceable to my evaluations when the word semantics was encountered, I now feel that a new term should be selected to refer to this field. This conviction has been reinforced by my experience in trying to explain it to others. I have found myself faced with the difficult task of separating general semantics from semantics. Since general semanticists are frequently referred to as 'semanticists' and the term 'general semantics' is frequently shortened to 'semantics,' it now seems to me that the verbal foundation has been laid for much unnecessary confusion.

In other areas of scientific work the scientist does not hesitate to discard a term when its use seems no longer suitable. If the use of the words 'meaning,' 'signification,' and 'semantics' is customarily associated with a misorientation in which the effective agent in behavior, occurring in a sign-symbol situation, is projected into the sign and/or symbol, then these terms should be avoided. And along with them the adjective 'semantic.' It may seem presumptuous of me to suggest discarding a well-established label such as 'general semantics.' But one should bear in mind that all I am attempting to do is to clarify my own thinking, to make the formulations of this new 'science of man' more effective in my own life, and also to facilitate my helping others to achieve a similar result.

The label which I have adopted as a replacement for 'general semantics' is derived from the word 'evaluate.' The process of *evaluation* in this discipline seemed to occupy a key position in relation to which the various other operational phases of general semantics were tributary. Therefore, from the word evaluate I have coined the term *evaluatics* for my use, and now whenever I encounter the expression 'general semantics,' I translate it, for my own use, into *evaluatics* or *symbol-evaluatics.* Where 'semantic' occurs as an adjective, I substitute the term 'evaluatic.' I should be happy to accept any other label than evaluatics if it should seem more appropriate. But with the current growth of the field of 'semantics,' which differs fundamentally from 'general semantics,' it seems to me imperative to adopt a new label to replace 'general semantics' if workers in this area are to escape unnecessary confusion.

J. RUSSELL BRUFF

Santa Ana College, Santa Ana, California

A. B. Johnson and a Reader

SIRS: Teachers attempting to instruct students in general semantics should not be discouraged, for difficulties in teaching the individuality of space-time events are not new. The other day I was thumbing through some old books in the New York Public Library and came across A. B. Johnson's *Discourse on Language,* published in Utica, N. Y., in 1832. The following is quoted therefrom:

> You perceive, we disregard the individuality of nature, and substitute a generality which belongs to language. The generality is an indispensable defect of the finitude of language; but creation is subject to no such circumspection. Creation exhibits John Charles and nine hundred and ninety-seven millions of other equally varying individuals. Language alone makes them identical. Measure then, no longer, creation by the poverty of a human vocabulary. The change is simple, but it will emancipate us from errors which are associated with all our learning.*

Alongside the last word in the quotation some reader apparently many years ago had made an asterisk and at the bottom of the page had written in pencil now dimly legible, and substitute 'confusion more confounded.'

At the end of the book, equally dim and apparently in the same hand, was written the following: 'the author has little "verbal identity" and no mental identity with any of his species.' Whether the latter is a compliment or criticism is left to the reader.

W. BENTON HARRISON, JR.

New York City

Through with General Semantics

SIRS: There are a couple of pieces in your Summer, 1947, issue that need a little comment. I refer to an alleged book review by O. R. Bontrager and an article by S. I. Hayakawa.

Bontrager's assault on *The Art of Plain Talk* comes under the head of plain silly. . . .

The piece by Hayakawa is even sillier. In order to discuss it at all, it is necessary to use the word 'art' as it has been used for centuries. Since so-called 'modern art' is not art, whatver else it is, let's call it 'blah' for now, until it gets its own name.

What Dr. Hayakawa does is make an assumption, or several, and then takes off, way off, into the blue. The assumption is that art is imitation, intended to deceive. He evidently completely misses the basic reason for art and, equally evidently, has been taken in by the limited fad for blah. He is not evaluating his subject-matter. He takes sides. Blah is, somehow, superior to art. That such things are a matter of taste escapes him; some people are ready duffers for

sensationalism. He ventures to call the work of the great illustrator Rockwell 'decadent' [the word was 'degenerate'— ED.]; whatever else it may be, that is what it is not. He sets up his judgment against that of many thousands, a piece of insufferable gall. . . . Hayakawa and a handful against the millions!

It must be evident that I object to this kind of stuff in the columns of *ETC.* If general semantics is to do the good it might, it will have to assess its professions a little more closely. It is not the univeral panacea; it is not the end-all and be-all. There are such things as facts . . . explaining all ills as semantic disturbances is absurd. (Sample: That anti-semitism is an 'identification reaction' does serious harm. It lulls the Jew into the belief that the horror-making distaste in which he is held is not any fault of his; that 3500 years of persecution are to be charged to those who don't like him and not to himself, wherein would lie the only hope of correction of a hellish thing. . . .)

I'm afraid I hate to admit I'm wrong about general semantics. But I guess I am. I had the idea that it would be an objective study. . . But when it attempts to make itself the most important thing in the world, claiming the world as unimportant, I guess that winds me up.

N. R. THURSTON

Waverley, Pennsylvania

Semantics and Irenics

SIRS: *ETC.* shows its broadmindedness by publishing Bykhovsky; and Bykhovsky shows his skill at Marxian dialectics and polemics by the verbal ease with which he not only stands semantics on its head, but overturns the scientific method into the bargain. (*ETC.*, 6.1-15, 1948)

The Russians' aptitude for polemics, like their aptitude for chess, is practically invincible. The question is whether polemics is a safe method for really important decisions, or whether it might not be wiser to develop irenics instead. Irenics is a word I recently learned for the reverse of polemics — that is, discussion used to promote peace and agreement. In this branch semantics is not the only available tool, but it is certainly one of the best.

MARIAN TYLER CHASE

Georgetown, Connecticut

> We may accordingly define a metaphysical sentence as a sentence which purports to express a genuine proposition, but does, in fact, express neither a tautology nor an empirical hypothesis. And as tautologies and empirical hypotheses form the entire class of significant propositions, we are justified in concluding that all metaphysical assertions are nonsensical.
>
> A. J. AYER, *Language, Truth and Logic.*

EVALUATIVE SYSTEMS AT WORK

Straight from the Scriptures

'Leroy (Satchel) Paige was born in Mobile, Ala. and says he is between 39 and 40 years of age. Everyone agrees that he's a good pitcher but there are many people who say he's bad when it comes to arithmetic.

'One of the people who doubts Satchel's ability to count, especially when it comes to such things as birthdays, is a bar maid at the Grand Hotel on the South Side. Her name in Janet Howard Paige and she was married to the Great Man of the Mound from October 26, 1934 to August 3, 1943.

'One year Satchel took his wife down home to Mobile to see his mother, Mrs. Lula Paige. His father's name was John Paige and he died before "Satch" was knee-high to a bat.

' "Satchel's more than any 39," the ex-Mrs. Paige said emphatically. "He took me to Mobile one year to meet his mother. She lived at 7054 Franklin Street. While I was there, his mother showed me the family Bible and it had births and dates of every one in the family. Satchel had seven sisters and three brothers. Now this is what I saw written in the Bible after his name: *Leroy Paige, born, July* 28, 1905.

' "He was the second oldest child in the family," Mrs. Paige said. "That would make him 43 years old. I saw it with my own eyes right there in the Bible. The Bible doesn't lie." ' (From an article on Satchel Paige in Chicago *Herald-American*).

Possible

'When a disease whose etiology is controversial is treated by a technique whose action is obscure, it is possible that the results may illuminate both the illness and the therapy.' Thelma V. Owen and Marguerite G. Stemmerman, 'Electric Convulsive Therapy in Stammering,' *American Journal of Psychiatry,* 104.410 (1947).

Hard to Please

'U. S. FLAYS RUSS WAR PROPAGANDA

'Paris, Nov. 12 (UP) The United States charged today that Russia alone of all nations is waging a shrill propaganda campaign, directed from the Kremlin, to prepare the Soviet people for war.'

'SOVIET PEACE PROPAGANDA TERMED DANGEROUS BY U. S.

'Paris, Nov. 12 (UP) Very high Western Power sources said today that reports of possible high level American-Russian peace talks came from a Soviet propaganda offensive of a very dangerous kind.' (Quoted by K. M. Landis II in Chicago *Sun-Times*).

Now He Knows

From the Chicago *Sun-Times:*

'DEAR DOROTHY DIX: I am a boy, 13, who is going with a girl 12. She says she loves me, but I don't believe her. Anyway, I didn't know what love was until I looked it up in the dictionary. When I did, I found I was in love with a cute girl 14 years old at school. Do you think I should go with the girl who is more my age, or leave them all alone until I get older?' HANDSOME BOY.

U Strakha Glaza Veliki?

A reader sends in the following clipping from the *New York Times:*

'The map that Andrei Y. Vishinsky had said was an American map of World War III came to light yesterday. It was a map printed by the Esso Marketeers during the recent conflict, entitled "War Map III, featuring Pacific Theater". . . .

'His [Vishinsky's] reference to the map was in his speech to the United Nations on Saturday. Esso, he said, had published "a map of the Third World War, Pacific Theater of Military Operations."

'The map's subtitle, stating that the map was the third in the company's series, contained the words: "A third War Map." '

Practically a Sure Thing

Quoted from the Chicago *Daily News:*

'Arthur H. Compton, atomic physicist and chancellor of Washington University, says elimination of major wars is a "sure by-product" of continued scientific growth.

'He said technological and commercial developments requiring world-wide co-operation may reduce the "probability" of war to a "remote possibility" after 30 years. But this, he said, depends on another war not interfering with advances in international co-operation.'

Nazi Evaluations

'The Nazi agitator whom, many years ago, I heard proclaim to a wildly cheering peasants' meeting: *"We don't want lower bread prices, we don't want higher bread prices, we don't want unchanged bread prices—we want National-Socialist bread prices,"* came nearer explaining fascism than anybody I have heard since.' Peter F. Drucker, *The End of Economic Man* (New York: John Day, 1939).

The Language of Wisdom and Folly

BACKGROUND READINGS IN SEMANTICS

Edited and with an Introduction by

Irving J. Lee

THIS UNIQUE ANTHOLOGY will be of interest to every one who is seriously interested in the problems of language and meaning. It brings together in a single volume 72 selections which bear directly upon the elementary, if not fundamental, aspects of the relations between language, fact and human evaluation. Many of our best minds in a wide variety of fields have been interested in the *problem of the word*. Dr. Lee has brought together here for the first time some of their stimulating insights and shrewd, practical advice.

The studies reproduced here represent some of the most important contributions to a general semantic point of view of anthropology, mathematics, logic, physics, medicine, history, letters, etc. The 77 writers represented are a stimulating and challenging group of scholars and thinkers, mostly moderns, including such individuals as George Santayana, Gertrude Stein, William James, H. G. Wells, A. B. Johnson, Morris R. Cohen, Carl Becker, Rudolf Carnap, Ernst Cassirer, Alfred Korzybski, Grace de Laguna, Franz Boas, Henri Bergson, Leonard Bloomfield, Aldous Huxley, Thorstein Veblen, Albert Einstein, Bronislaw Malinowski, Edward Sapir, and others of equal note. The selections were taken from a wide variety of sources, many of them no longer available.

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